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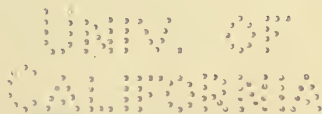
American Business Methods

For Increasing Production and Reduc-
ing Costs in Factory, Store,
and Office

By

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TO MY FRIEND

GEORGE HORACE LORIMER

IN APPRECIATION OF ENCOURAGEMENT AND ADVICE

HF5356

P₃

PREFACE

The purpose of this book is to supply the reader with practical knowledge of ways and means to increase production in any and all lines of business. In a material sense, production is the true measure of success of a corporation or an individual. Generally speaking, the fundamental principles of business are quite similar whether a man manufactures locomotives or sells lead pencils. The real secret of "getting ahead" in any line of work appears to be ability to adapt the best practices of others to the business in hand.

The data contained in this volume have been gathered from hundreds of leaders in dozens of industries. Much of the information has resulted from careful research and personal interviews, and has formed the foundation of articles published in the "Everybody's Business" department of *The Saturday Evening Post*. In fact, the volume has been created largely as a result of the requests of many *Post* readers that the facts presented be elaborated and collected in book form.

Every effort has been made to reduce the descriptive text to the fewest possible words and express the thoughts in rapid style and language that is direct and non-technical. At the same time, care has been taken to include sufficient detail of the methods discussed to make the suggested plans actually workable. So far as possible untried schemes have been eliminated from the

text. It has also been the writer's aim merely to suggest a variety of approved methods for handling industrial and commercial problems, leaving the selection of any specific plan to the judgment of the reader.

It is probably true that the book as a whole represents more research and more hours of labor than has ever before been devoted to any work of a kindred nature. There are many splendid books covering definite and distinct phases of business procedure, but investigation fails to disclose any volume that attempts the ambitious plan of treating all of the important problems that underlie modern commercial and industrial practice.

The writer would be ungracious if he failed to record his appreciation of the valuable assistance rendered by Alex Moss in arranging the mass of material so that the text has continuity of thought. Such a result is not easy to attain in a book of this character made up largely of unrelated facts. There is of course a wide difference between a novel which flows smoothly to a definite end and a commercial text-book which endeavors to suggest rules of business conduct for those engaged in diversified pursuits. A further acknowledgment of indebtedness is expressed for the faithfulness and accuracy of Mrs. Margery McNabb in transcribing notes and to the hundreds of friends who have aided in the collection of data.

FLOYD W. PARSONS.

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American Business Methods

CHAPTER I

INTRODUCTION

Men work best when they are happiest. If this is true, it follows that the carrying out of plans looking toward the establishment of healthful surroundings and harmonious relations in all lines of business must result in increased efficiency and maximum production. Health in relation to industry is receiving more serious attention as time goes on.

The average duration of a human life is 51.5 years. If we should succeed eventually in eliminating preventable diseases, this figure would be changed to sixty years. Furthermore, if one day we should save the children who now die needlessly from ignorance on the part of parents and improper care, the nation would have at least 10,000,000 more healthy grown-ups, each producing no less than \$3 of wealth a day. In other words, a low state of hygiene in the matter of child health costs the United States \$30,000,000 every twenty-four hours. No one can take a broad view of a country's business and yet fail to consider the health of the citizenship as a prime essential.

Closely connected with the worker's health, and of equal importance, are the industrial conditions under

which he labors. The man who lacks physical vigor is naturally limited in his productive capacity. However, he is likely to be just as inefficient if he is dissatisfied with his general treatment, wages, and opportunities. A great deal has been written of late concerning plans designed to eliminate labor unrest, increase production, and lessen the waste of time and material. Notwithstanding the best efforts of the leaders of industry in recent years to solve the labor problem, no general remedy has been found, and the question remains acute. We may be tired of discussing strikes, and feel inclined to turn our backs on the problem as hopeless of solution, but such action would be neither wise nor courageous, so the only sensible course of action is to make a careful study of all the plans and methods that have been used successfully by others, and from this accumulated knowledge on the subject, each management must try to select the one scheme that appears to suit its own case best. It is essential in handling the labor problem that employers remain firm in the belief that conflict and misunderstanding will eventually succumb to science and education.

The need on all sides is for education. Not only education of the lowest, but of the highest. The industrial problem will be solved only when the caste system disappears—when the workers in an industry are represented in that industry, and receive a just return for their participation. Americanization in its broadest aspect means the eradication of ignorance. Arbitrary rules from which one refuses to recede because of ingrained prejudice or established custom are out of accord with the spirit of the times.

The *summum bonum* of all efficiency is the elimination of waste—the doing away with of incompetence. Experts have figured that the losses due to industrial incompetence amount to \$15,000,000 a day. A considerable loss results from faulty assignments. Everywhere men work on the wrong jobs. Industry would be best served if it assisted men to serve themselves—find their proper niche. Losses due to faulty assignments in all American industries are placed at \$20,000,000 a day. It would not cost anywhere near this sum to give the workers proper conditions—in home, factory, and office.

In 1915, there were approximately 700 strikes in the United States; in 1916, there were more than 1000; in 1917, there were 1700; in 1918, there were 1900, and in 1919, more than 2200. During the last year mentioned, the loss to labor from strikes was estimated to be \$750,000,000, while the loss to capital was \$1,250,000,000. Such a situation contains a warning that should not be ignored. The reduction in the number of strikes in 1920 was due to the slowing down in business and to the fact that workmen are never so inclined to go on strike in a time of unemployment. It is only natural that men will work harder and strike less when they are afraid of losing their jobs and doubtful as to whether or not they can get others; but if their greater diligence is prompted only by fear then we have a type of forced efficiency that is based on a most unstable foundation. Men must be reached through their minds, not through their stomachs.

Strikes are far more injurious to a company and to industry generally than most people imagine. When the workers think they have won, they return to their jobs with an independent, indifferent mood, and the

certain result is a material decline in production. If the men go back believing that the management has won, they resume their work in a vindictive frame of mind, and the consequence is that not only production suffers, but spoilage and waste increase. It is far more difficult to bring about a return of harmony and good will among the employees of a company after a strike than it is to prevent the trouble in the first place.

Employers who believe in fighting labor are short-sighted. The history, not only of industry but of the whole world, shows that fighting an ideal only makes it stronger. Injunctions and lockouts may bring victory to the management of a corporation, but they will never permanently settle the company's fight with its men. On the other hand, it is just as bad to surrender to the workers, for such a course only prepares the way for another demand for increased wages. The one sound method of solving the labor problem is to educate workmen so that their mental attitude will be reasonable and unprejudiced. It is just as sensible for an employer to cultivate the good-will of his men as it is to cultivate the good-will of customers. The two policies, "the public be damned" and "labor be damned," have been discarded forever.

Corporations have thought too much of their own individual welfare, and too little of the welfare of the nation's industries as a whole. In years gone by, it was the common practice of most companies to deal with radical workers by discharging the trouble-makers. As a result of this plan, a so-called radical employee would go from plant to plant getting and losing one job after another, but always becoming more of a radical and ever sowing seeds of discord among the workers he met.

Most radical workers, if properly handled, could be educated and converted into fair-minded individuals. The very fact that a man is a radical is an indication that he is a fellow who thinks, and the chances are that his mind is more alert and keener than that possessed by the average workman. Nine times out of ten he thinks wrong because he has not been educated to understand the other side of the argument. Consequently, it is far better to develop the radical into an extra-good workman than to keep him moving about as an active disciple of labor unrest. When a machine fails to function properly, it is not thrown on the scrap heap, but repaired. Why not use equal intelligence in handling the human machine?

The most important problem to-day in the handling of labor is the development of a fair and constructive attitude of mind on the part of the workman. Corporations have spent millions in welfare work, only to have their efforts end in a costly strike. As one employer said: "It isn't what you do for your men; it's what they think you do for them that counts." Not many years ago the majority of workers were genuinely proud of the great corporations that employed them. This spirit has disappeared, and it will not be reëstablished until management recognizes the fact that it is equally as important to educate from the bottom up as from the top down.

Most men profit by their own blunders, but the gaining of experience and knowledge through personally making mistakes is the most expensive kind of an education. It is far better to acquire wisdom from the successes and failures of others. Most kinds of business have grown so rapidly in recent years that the average

executive can no longer be a specialist in a single line of work. He must have a general understanding of both men and machines and possess a working knowledge of the various arts and sciences that enter into the practical operation of commerce and industry. The modern manager must refrain from a policy of trying to govern industry by hard-and-fast rules. Negotiation should always be tried before force. Many a swimmer has saved his life by yielding to the tide.

Many men stand still in business through their failure to devote spare hours to studying the successful methods employed by others. Almost everyone has heard the question, "What is the cash value of an education?" The other day I heard of a young woman who went to work in a bank. The employer said to her: "I will start you at \$1200 a year; if you could do book-keeping, we would pay you \$1600." Here we have one fairly definite basis for calculation, so let's see where we get. The average person can learn to keep an ordinary set of books in forty hours of earnest application to study. This means that in any case like that of the bank referred to above, forty hours devoted to the acquisition of special knowledge will bring a return to the worker of \$400 in one year. This is at the rate of \$10 per hour for the time devoted to study and is fair wages when you consider that the investment made by the ambitious individual cannot be lost, and will go on drawing interest year after year.

A hundred other instances could be mentioned where the value of hours of study might easily be expressed in terms of real money. If one job pays \$2000, and another one in the same company pays \$3000, the total hours required to master the intricacies of the better-

paid work has an annual value of \$1000. Some people might acquire the needed knowledge in fifty hours. If so, their wages for study, based on the reward of a single year, would be \$20 an hour—quite a profitable pursuit.

While the text of this book is not altogether lacking in sentiment, especially in those discussions that deal with the human element, the aim of the writer has been to present practical working plans rather than doubtful ethical theories. Most lines of business are quite materialistic and to a certain extent impersonal. If the volume will help to develop harmony between employers and employees and at the same time suggest to each reader even a few better ways to do things, it will have reached the author's goal.

CHAPTER II

INDUSTRIAL RELATIONS

Fundamental Facts—Leadership—Qualities Essential to Leadership—Interest in One's Work—Incentives to Work—Bonus Plan of General Motors Corporation—Savings and Investment Plan—Free Clinics—Profit-sharing Plans—Experiments in Industrial Democracy—Workmen's Committees—Labor's Attitude toward Industrial Democracy—Successful Industrial Plans—Coöperative Associations—Employees' Advisory Board—Union Coöperation—Kansas Industrial Court—A New Departure in Plant Operation—A Unique Idea in Industrial Organization—A Human Laboratory—Working Conditions in Offices—Employees' Entrance Examinations—Encouraging the Saving Habit—Encouraging Home Ownership—Idleness and Production—Value of Educating Foremen—Education of Fellow-workers—Industrial Upheavals—No Service without Reward.

Fundamental Facts. Social and industrial conditions throughout the world are not perfect, and only a fool will argue that they ever will be perfect. However, it is inconceivable that modern intelligence will fail to reduce greatly the number of human miseries that now afflict us. The fact that 33 per cent. of all the people who reach the age of 25 die before they are 60 is purely a sermon on health, but a further fact which shows that of every 1000 men who reach the voting age only 115 are self-supporting at 60, and the remaining 535 still living are dependent on charity or relatives, is a stern condemnation of the social and industrial system under which we live.

The problem of industry to-day is not equipment or

salesmanship, but the fitting together of boss and worker—employer and employee. The future of all our industries hangs upon the human factor. We can go ahead only upon a basis of complete coöperation. Everyone must have his fair share of present profits and future opportunities. These are fundamentals. Those who deny them encourage the preachers of revolution and strengthen the hands of violent radicals who would proceed along lines that are neither sound nor economic.

Because strikes nearly always were based upon wage demands, most of us were led to believe that money was really the cause of these labor troubles. Now we know that the dissatisfaction was frequently caused by something else—wages were only a pretext. Strikes are at present taking place in industries where the employees themselves concede that the wages they receive are as high as can be paid. What they now want, and what they have always wanted, is a place in industry equal in dignity to that of the employer. With the introduction of steam the laborer felt that he lost caste, and he now demands that this fancied loss be made good. Only a small per cent. of recent industrial plans based solely upon the policy of paying higher wages has increased the worker's interest or lessened his discontent.

One of the unfortunate things is that our American-born citizens fight shy of the trades. They take to the farms or offices or engage in small individual enterprises. Seldom do you find a native-born son at a machine in a big industrial plant. This is not to be taken to mean that this kind of work is not done by American citizens; it is, but frequently they do not speak English, and their

loyalty, though often requisitioned, is too commonly of a platonic international character. When the machine itself became the real worker and the man became the assistant to the mechanical device, the native American got out. It used to be that we had all-round machinists; one of them could build an entire engine if you gave him the tools and the time. But at present no one man builds even the smallest part of a truck or a tractor; instead of the general worker we have a series of skilled machine assistants.

When employers commenced to discern that their men were without interest in their work they looked about them and made the discovery that though their machines were automatic their factories were not. One employer found that he was hiring 2500 people each year to maintain an average working force of 900. He investigated further and learned that it cost him \$85, on an average, to break in each new operator. In other words, his labor turnover was costing him more than \$200,000 annually. Other owners made similar discoveries. Remedies were sought. Some decided to pay their men on the piece basis, rewarding them for what they did, not for the time they worked. Other managements tried to increase the interest of their employees by providing better living conditions. A few evolved stock-purchasing plans and profit-sharing schemes. Some of them worked, but all of them together were not a cure-all. One lesson was learned: There is no worthwhile industrial policy to-day but coöperation. No other basis is either sensible or safe.

Leadership. Having discovered that high wages alone were not a panacea for labor ills, and that not even safe and healthful working and living conditions offered a

solution for what has come to be known as "labor unrest," far-seeing employers began to study the problem from its human side. Just what was it the worker wanted in order to make him happy, contented, and satisfied at his work? Experiments in humanics soon disclosed that the new angle from which the subject was being approached gave more promise of bringing about a satisfying solution than the numberless cold-blooded, practical schemes that had been tried without success.

The problems presented by the attempt to weld into one harmonious, homogeneous whole the various factors entering into industry developed that there were two sides to the question of industrial relationship. Attitudes had to be changed; opinions had to be recast. Age-old beliefs were found to have been based upon prejudice and misconception.

In the past men were studied from an autocratic standpoint. The time has now been reached when an employer who studies his men from any other than a democratic point of view must fail to get a proper appreciation of the human element. Men now cannot be driven, they must be led, directed. Less than a generation ago great financiers thought they had discovered a way out of their industrial troubles by combining many small companies into one large organization, but though they did succeed in paying larger dividends it was soon found that they had overlooked the most important thing—the human element. The formation of great industrial units tended to accentuate instead of relieve the difficulties resulting from a strained relationship between employer and employee. Even the slight personal touch which had hitherto existed in the smaller concerns was eliminated.

It is a fundamental truth that management and not money, that leadership and not labor, is the source of all progress—the fount of all wealth in industry. The two great delusions of to-day are: First, that all wealth and progress are created by labor; second, that all wealth and progress are created by capital. The truth is that neither one nor both of these factors combined create wealth and prosperity.

The conditions that make prosperity are provided by mental qualities which are the very opposite of muscular or financial activity. Labor, material, or equipment are not effective unless directed properly. Russia with its teeming millions of strong, husky manual laborers is proof of this. The Arabs of Arabia still live as Abraham lived. There are upward of four hundred million people in China who are frugal and toil diligently, yet they have never prospered.

The greatest lesson of the world is that leadership is the first essential to progress.

The capitalist asserts that labor is not working efficiently. Labor insists that capital is not treating it fairly. The air is filled with disturbing rumors, and through it all the fundamental truth as to the cause of labor unrest is overlooked by many. The basic fault is a lack of sureness of direction. Old guide-posts have become weather vanes and are swinging with every wind that blows. Workmen to-day are demanding leadership, and having no assurance of the proper kind are accepting in many instances the inferior and the unscrupulous rather than have none.

The capitalist justly complains that men are not producing as much as formerly. Facts and figures are at hand to prove that this is true. In some cases men

are getting twice the pay for half the work they did formerly. This means paying four times as much for a product as heretofore. At one big plant the figures show that the actual amount of work done in eight hours amounts to three hours and seventeen minutes as measured by pre-war standards. Jobs that formerly took ten hours in some cases now consume twenty-eight hours. This means that employees in many places are attempting to capitalize hours of idleness. The inevitable result will be that eventually people will buy where idleness is not capitalized.

Out of all this is ringing a clarion call for sound leadership. The task of the manager is to achieve good wages for labor, a cheapened product for the consumer, a profit for the management, and a fair interest for capital. What is needed is a man—not men, not money, not machinery, not markets, not methods—just a man.

A wise policy is of more avail than a huge pay-roll or a large plant. The total employees of any corporation are just what their leaders make them. It is the big boss who gives the men their character and tone, their energy or inactivity, their efficiency or laxness; his firmness and discipline are reflected to the lowest man. A department or an enterprise is but the lengthened shadow of one leader. If this man is second-rate the department or enterprise will be second-rate.

Every man is the result of his ideals, and though an ideal is an intangible thing it is the only indestructible thing on earth. We think of matter as being indestructible, but ideals alone survive. They live where kingdoms and empires perish. It is just as necessary to take stock of ideals as it is to take stock of material,

equipment or man power. The ideals of any leader should be simple, direct, and appealing.

Here are the ideals of one great captain of industry:

To do the right thing at the right time in the right way; to do some things better than they were ever done before; to avoid waste; to know my men personally; to anticipate requirements; to develop my own resourcefulness; to work for the love of the work; to master circumstances; to act courteously; to act from reason rather than from rule; and to be satisfied only when I have accomplished all.

Qualities Essential to Leadership. The three great mental qualities essential to good leadership are vision, initiative, and conviction. The average workman thinks only on the matter in hand and rarely on the task to come. Too many people rely exclusively on common sense to carry them through. Common sense is like salt at a meal—it is flavor rather than food. Skill, study, knowledge, and ability to see ahead are as necessary as common sense. Efficiency isn't organization, for organization alone may do nothing. Industrial management does not mean everything new against everything old. There are plenty of new things which ought to be instantly discarded and plenty of old things which ought to be kept.

The world pays a man for putting things over—not for thinking things over. We respect a man who acts, because he displays control over crisis. The great leader notes what should be done and then does it on the instant, caring nothing for precedent or preachment. He possesses the power to mass his forces on a set point at a time for a set purpose. Books are merely echoes of what men have learned by doing things. The crime

in popular education lies in regarding the mind as a memory box instead of a motor. The child walks by trusting his muscles despite his failures. No man has mounted the first step to achievement who has not learned to make mistakes nobly and retrieve them gracefully. Fear is but chronic inability to act. What we fear we invite.

The average man uses only a small fraction—a third to a tenth—of his inherent brain power. The rest lies dormant. Why? Because original thought is lacking, and that is the only kind that really builds the cells of the brain. No man can really challenge the world's attention unless he has a new idea. Money may be the measure of what people want, but they have to be shown before they know what they want. They did not know they wanted the telephone, telegraph, sewing machine, or automobile until certain wise leaders foresaw the demand and prepared to meet it.

A requisite of leadership is the ability to concentrate on vital factors and to subordinate detail. Napoleon said, "Get your principles right and the rest is a matter of detail."

The old way in industry was to buy a man's time irrespective of his efficiency. Neglect on the part of the employer to recognize individual ability and to reward it properly forced the worker to fix his attention on the wages he received and made him indifferent to the amount of work he accomplished. This put a premium on inefficiency and the result was unionism. Yet instinctively labor does not like unions. They stifle initiative, penalize individuality, and repress talent, but there was little left to do. As the unions grew in power they classified men by grades and intro-

duced a situation that approaches slavery in the enforcement of its class creeds. To belong to a union now is to guarantee that you will not work too hard to suit the slower workers. This holds down the highly trained worker to the level of the dull, inefficient artisan. Some day labor will wake up, but no one need expect that it will throw away what it has until something better is offered.

The amount of progress American industry has made—the position it is in to-day—is not nearly so important as the direction in which it is headed. The most necessary thing in the United States at present is the right kind of leadership. The masses of our people will follow honest, intelligent, just men, who have high ideals and a deep respect for the proper application of that chief of all first principles—the Golden Rule.

Interest in One's Work. With the knowledge that the only way to solve our present stupendous industrial problem was to go back again to first principles came the discovery that the secret of efficiency was indissolubly bound up in interest in one's work. We need not go farther than this thought to deal with the oldest problem in the world. The way to stimulate interest is to set a definite task for a worker to do in a given amount of time.

The next step is to offer attractive reward for successful accomplishment. When definite tasks and times are set it makes all the difference between working with an object and without one. The ideal of setting a task with a reward for its accomplishment is in accord with human nature and natural law. The hunter, soldier, and business man can set their own tasks in advance and work for a suitable reward. The worker, however,

cannot set his own tasks, and for this reason he needs leadership.

Not so long ago manufacturers attempted to remedy the situation by establishing a system of piece-work. This shifted the responsibility from employer to employee, but the latter refused to accept the results. In hundreds of plants piece-work rates were cut on a single job from two to seven times in one year. It was further discovered that piece rates do not reward or take into account such things as fidelity, length of service, and reliability. They reward physical output, but exalt the young and strong over the old and wise who have aged in the service.

Increasing output by paying more money as rewards is efficiency and is much cheaper than putting up new plants, buying more equipment and hiring more managers. None of us believes that all men are created equal, but all of us must believe that all men are entitled to equal opportunity. In running an industry it is imperative to bear in mind that the men produced are far more important to the life and prosperity of the industry than the amount of money that they produce for the owners of the industry. The plant that has the best men will assert its superiority as surely as a cork will rise in water.

Work of any kind is accomplished with least fatigue when three conditions obtain: The attainment of form, the sustained interest of the worker, a definite task. If the worker attains form he can accomplish remarkable results with minimum fatigue. If he is interested he can endure tremendous strain without harm. A man can play golf with its definite task, and experience far less fatigue in the effort than will result when he

accompanies his wife on a shopping tour with no limit as to time or distance. The reason why baseball players, football players, and other athletes can work so much harder than ordinary laborers is because all three of the necessary conditions are realized.

The bonus plan of employment sets for a given time a definite result. The time must be so ample that a man can easily beat it—can therefore develop form—and his interest is thus roused in a double manner—first by beating the game and second by pulling down a reward. His interest is continuously stimulated, for as he beats the game more and more through the attainment of better form he pulls down an ever-increasing reward.

It has been found by exhaustive experiments that the worker can keep up indefinitely half the speed he can obtain by extreme effort. This half speed we will call standard. A very easy speed is one third of extreme speed. A man is out of his place if he cannot show even at the start one third of maximum speed. If any greater speed than one third of maximum is attained a bonus is paid. To illustrate: If extreme speed for an hour by a professional bicycle rider on a track is thirty miles, we would call half of this, or fifteen miles, a high standard, and ten miles the lower limit. On the open road these figures would drop to twenty-four miles for extreme, twelve miles for standard, and eight miles for minimum. Some time has to be allowed for rest, say ten per cent. This would put the standard for a full day at 10.8 miles an hour and the minimum at 7.2 miles an hour. We could pay a man no bonus for doing an average of seventy-two miles a day of ten hours. We would call him to account if he showed

less than seventy-two miles. We would give him twenty per cent. bonus for 108 miles. Above 108 miles we would give him bonus for all the time he saved at his dayrate and twenty per cent. for the time he worked.

If a workman beats the reasonable standard he is entitled to all of his savings at his day rate, for the plant makes a gain through the lessening of overhead charges.

The method of calculation is a most important feature. The men know as a rule exactly what is coming to them. They know the actual hours worked and the standard hours delivered. If we divide the standard hours by the actual hours the efficiency expressed as a percentage is determined and the amount of bonus depends on this percentage. For example:

Wages per hour.....	\$ 0.30
Actual hours worked in a month.....	262.5
Standard hours delivered.....	286.7
Efficiency—286.7 divided by 262.5.....	109.2%
Bonus.....	29.2%
Wages.....	78.75
Bonus.....	23.00
	<hr/>
	\$101.75

Men working on this plan have no difficulty whatever in making these calculations and some of them, in fact, figure their status from day to day. The difficult task in this kind of a scheme is to establish thoroughly scientific standards such as a physician, a physiologist, a psychologist, a moralist, and an athletic trainer would sanction and approve. Because this job is so difficult we approach it by degrees. We put in temporary schedules at first by groups and gangs and allow the

plant to feel its way to ultimate operating schedules. It is extremely important to reach the standard and any bonus system that does not accomplish this is defective. The aim should be to pay neither more nor less than that amount of bonus which will maintain the worker's interest in his job.

Offer an average man too little bonus and he loses interest, he flags. Offer him too much bonus and you spoil him and rob the plant. It must not be forgotten that some tasks are more disagreeable than others. The way to overcome this is to vary the schedules rather than change the bonus rate. Schedules should be easier for blacksmiths than for boiler makers, and easier for the latter than for machinists. The main object of the whole plan should be to fill the shop with selected thoroughbreds. If a company has to offer larger bonuses to do this it should not hesitate.

At the present time we have very few standards by which to measure a day's production. We negotiate about wages, and often ignore the amount of work that must be delivered for the pay received. A study of what constitutes a fair amount of work, jointly by management and men, must inevitably develop just standards for workers of different degrees of skill.

Incentives to Work. Interest in the tasks of the day having been awakened, it rests with the management to see to it that the interest is sustained, that it does not die for any one of a number of possible reasons. Only by sustaining the interest of the worker in his job will the greatest degree of efficiency be obtained.

Efficiency depends upon the application of human energy as well as upon the perfection of mechanism and process. The essential incentives to interest in

work are: Self-choice of the activity, pleasure in its continuance, a sense of value in its performance, and opportunity to secure the approval of one's associates for one's accomplishments. When the chance for self-choice in the matter of a job is removed the labor entailed becomes drudgery. Monotony is present when work has become automatic and makes no demands upon active attention.

Most companies have done very little to relieve the dullness of routine jobs by insisting that no employee shall be allowed to remain at any one task beyond a certain period of time. Among the suggestions made for increasing interest in work is a systematic plan of transfers. Such a plan of transfers requires a change in the present mental habits of managers and workers, but it would be a change in the direction of releasing positive and active qualities in the employee. One of the new watchwords of industry will be: "It pays to transfer."

It appears to be the best opinion of close observers that the interest and output of workmen are increased by adopting a plan that permits the employee to acquaint himself with his own proficiency, and at the same time make it possible for him to compare his individual achievements with those of his co-workers. Added to this, each worker should be carefully informed concerning not only the relation of his process to the finished article, but with respect to the economic value and importance to society of the completed product that is being turned out. Every normal man desires the approval of his fellow associates and is anxious to stand high as a skilled worker in the eyes of those with whom he labors.

Too much emphasis cannot be placed upon the effects of fear in the minds of manual workers. Whatever alertness or responsiveness the fearful person has is all in the direction of preventing the realization of his fears. The chief of all worries in workmen is the fear of loss of employment. Other fears are created by the possibility that labor-saving machinery may be introduced, and frequently men are afraid that the more work the individual performs the sooner will come a completion of orders and a lay-off or wage cut.

One company obtained much benefit from training a number of its executives as guides and then showing the families of all the workers through the plant in small groups over a period of two or three months. The results following the experiment proved the wisdom of having the employees' families familiar with the work the men were doing.

Modern managers are leaning more and more to the belief that the maximum interest of workmen can be aroused only when the corporation tenaciously holds to the policy that its purpose is to render useful service rather than to extract the ultimate in profit. When the dominant motive in a company is sheer profit-making, regardless of the best interest of the community, the sympathies and interest of the men will not be so strong as when the business is run under a rule of limited returns to capital. Each unit of every industry must eventually become a great self-governing democracy of systematized public service. Unless our business institutions are reorganized in conformity with such an ideal, the whole matter will soon resolve itself into a question of which shall survive—factories and machinery or the human soul and personality. The

most satisfactory future lies in providing a situation where both the human and the material factors will flourish together.

Bonus Plan of General Motors Corporation. No industry can become a giant among industries without in that industry some leader developing and becoming a giant among men. In the building up of the General Motors Corporation, Mr. W. C. Durant, its president, played no small part. His psychology, so far as his seventy thousand employees are concerned, is summed up in his own words as follows: "You can't gather sympathy out of a book. No manager can be successful in his contact with workmen unless he understands human nature, and you can't do this unless you have experienced personal associations."

Mr. Durant believes that the most valuable experiences of his life had been accumulated during the days when he was occupied as a traveling salesman. He says:

Too many people expect to find one hundred per cent. men, and when these folks fail in such a search they proceed to lose a good part of their faith in all of mankind. There are no perfect people, and the only way to secure the highest efficiency out of those we employ is to place responsibility upon them, show confidence in them—do this for the man and not the company—and finally encourage and reward pride in accomplishment more than pride in profit.

In attempting to meet the present situation in the labor world, Mr. Durant has put into effect a rather elaborate bonus plan and also an employees' savings and investment scheme. The bonus fund is credited yearly with an amount equal to ten per cent. of the net earnings of the corporation after deducting six per

cent. on the capital employed in the business of the company, it being intended that this fund shall be invested in stock of the corporation. At the end of each year lists of employees entitled to bonuses are prepared in accordance with a classification of the workmen with respect to merit and salaries earned. As a general rule no employee is permitted to share in the company bonus fund unless the worker has been with the corporation for one year.

Additional bonuses—called royalty bonuses—payable in stock of the company, are awarded to workmen for inventions, suggestions, ideas, or improvements of value to the corporation. Each case is determined on its merits.

Savings and Investment Plan. As to the savings and investment plan, all workers who have been in the employ of the company for three months or more are eligible to participate in the scheme. Each employee has the right to pay into the savings fund each year an amount not to exceed ten per cent. of the person's wage or salary, but in no event shall the amount so paid in exceed three hundred dollars a year. Payments must be made in amounts of five dollars or multiples thereof. The corporation has also established an investment fund into which it pays an amount equal to the total net payments that are made by the employees. In other words, the corporation duplicates dollar for dollar the total amount of the employees' savings. The company agrees to credit interest at the rate of six per cent. per annum upon all amounts paid into the savings and investment fund. Such interest accrues from the first day of the calendar month following the date of deposit and is credited semi-annually.

In the working out of this plan it is a fact that at the end of the five-year participation period the employee has to his credit twice as much money as he put in, with interest besides. The workmen are permitted to withdraw all or part of their contributions to the savings fund, but if they do so they forfeit whatever share of the investment fund has not been credited to their account. The forfeitures are invested for the benefit of the employees who stick. At the end of a participation period an employee may withdraw, if he desires, his cash and stock or he may leave his cash with the company to draw six per cent. interest. The worker may also enter another participation class and keep on saving with the aid of the corporation.

Free Clinics. In addition to the foregoing investment and savings plan, which is designed so that the employee who sticks will get twenty-six per cent. a year, the various subsidiaries of the General Motors Corporation have inaugurated free hospital treatment and dental clinics where the workers may have their teeth attended to without cost. At one plant not far from New York the company has employed a chiropodist to look after its employees' feet, and a lawyer to serve as a sort of adviser in matters of both a business and domestic nature. The task of this counselor is to keep the workers out of litigation, eliminate their difficulties, and thus render them more fit for their jobs.

Profit-sharing Plans. More than thirty years ago there was quite a movement in the leading countries toward the establishment of profit-sharing schemes. The plan then lost headway and only in recent years has it again come up for close attention. It is appropriate therefore at this time to state briefly a few facts

relating to employees' profit-sharing plans that are taken from the experience of many industrial concerns. First and foremost is the truth that no profit-sharing scheme can be substituted for a proper and adequate wage-payment system.

A great automobile concern recently adopted a fifty-fifty profit-sharing plan. The company specified that its permanent capital should get a fixed return of seven and a half per cent. An additional three and a half per cent. was charged off for depreciation and one per cent. was ordered set aside for a rainy day. Here we had one of the most carefully worked out profit-sharing plans ever devised, yet only one week before the first profits were distributed the company barely averted a serious strike and the workers demanded a twenty-five per cent. advance in wages. Only a few weeks later a real strike did occur.

More profit-sharing plans have failed than have succeeded. In most cases where the scheme was discontinued the management claimed that employees were suspicious of the motive behind the plan. They frequently charged the company with falsifying their books, and nearly always in lean years, when no bonuses were distributed, charged the corporation with holding back earnings. In several instances the workers themselves requested higher wages instead of a possible share in the company's profits. Practically always there was a spirit of "Gimme mine now."

The Federal Department of Labor in Washington investigated twenty-six cases where profit-sharing policies were abandoned.

The reasons given were as follows: In eight cases the plan did not satisfy employees. In five the men went out

on strike. In five more the men preferred an increase in pay. In four the plan failed to increase efficiency. In two the scheme benefited undeserving employees. In one case the plan did not tend to increase the stability of the labor force, and in another instance the scheme was discontinued because of the general upward trend of wages and competition. All of which presents the general plan of profit-sharing in a rather unfavorable light.

But most of the plans for rewarding employees depend for their success upon investment or thrift features that raise them out of the class of strictly profit-sharing schemes. However, most of such plans have shown a tendency to reduce all workers to a common degree of efficiency based upon the productive capacity of the weakest. Wise managers now realize that every method of reward for employees, to be successful, must provide for a proper recognition of individual accomplishment. If adequate wages are paid there is little necessity for profit-sharing. Should a company enjoy unusual prosperity, there is much to be gained and little to be lost by distributing an unexpected bonus among workers who are already receiving a wage that is just and satisfying.

Experiments in Industrial Democracy. Wise business men are no longer devoting their attention to industrial expedients but are spending thought on the value of certain industrial principles. The causes of business inefficiencies and unrest are deep-seated. Expedients may be popular, but they afford only temporary relief. Every plan worthy of notice must be founded on a sound principle. It is not a question of whether a method will work for a month or a year, but whether it

is permanently valid. The fundamental laws governing humanity are as old as the primary laws in physics and astronomy. The law of gravity is still on the job notwithstanding the fact that the airplane enables a man to climb a few miles up into the air. So it is in business: The old natural laws continue to endure, notwithstanding the occasional adoption of freak methods or policies by numerous misguided individuals.

In recent years we have heard much about industrial democracy. There are a dozen different ideas concerning the real meaning of the term. One such scheme that is interesting is a plan developed by John Leitch. Various companies have adopted his ideas and report satisfactory results. Here is what the president of one large corporation said of the plan:

We inaugurated industrial democracy in our plant nearly three years ago and it appears to be a solution for most of our labor problems. The scheme we use is modeled after the Federal Constitution of the United States. We have a cabinet composed of the executives of the company, a senate composed of foremen and heads of departments and a house of representatives elected by the whole body of workers.

Meetings are held once a week, and such questions as wages, hours of work, holidays, quality and quantity of production, sanitation, labor turnover and similar problems are thoroughly discussed by the senate and the house, which meet separately on the company's time. The cabinet has the power of veto, but during the two years or more that industrial democracy has been in operation at our plant it has never exercised this power, there having been no occasion for such action.

The success of our plan is based upon the confidence and coöperation of the whole body of workers. Our scheme provides for a dividend system by which the company shares

fifty-fifty any saving in the cost of production, whether gained through increased output or through a saving in overhead expenses. The dividend is paid every two weeks in an envelope marked "Employees' Dividend." In two years this bi-weekly dividend has never been less than six and a half per cent. and it has been as high as seventeen and a half per cent. In addition to establishing a happy relationship between management and workers the plan has enabled us to turn out more and better goods. We have been in business for more than a half century and this is the best move we ever made.

The company in question is the largest manufacturing concern of its kind in the world and employs about one thousand men.

The president's story, however, does not complete the picture. Let us get the employee's point of view. One of the company's workers, who is a member of the house of representatives, says:

I have seen this plan of industrial democracy in operation for more than two years and I'm for the scheme, because through it I can always get a square deal. Under the old system a man with a cause for dissatisfaction would often keep his grievance to himself, or tell other employees about it. Frequently he would nurse his trouble until it became so large he would finally throw up his job in disgust. But now this does not occur. The worker knows he can carry his grievance up to the big bosses in the cabinet if it should be necessary to go thus far to get justice. However, we find that industrial democracy does not permit little troubles to grow up to be big ones. Nowadays at our plant you never hear the foremen urging the men to get on the job. There is no need for it. We all know that by doing our best all the time we are increasing our own dividends.

At present when a man knocks off early, comes in late or takes a holiday it is not the boss who wants to know the reason why but the other workers whose dividends he is lowering. In the old days it was every man for himself; now it is all for one and one for all. I have worked here twenty years and never before has there been such a general desire to coöperate.

Said another employee:

Our new plan of industrial democracy has proved that many of our men had valuable ideas locked up in their minds. Some of these plans included practical suggestions for bettering the efficiency of machines, but the owners of the ideas in the old days would not divulge their thoughts because they were not sure what reception the management would accord their schemes. To-day we all know that a good idea will not only be welcomed but will be rewarded. As a result we are adding more and more labor-saving machinery which has been invented by the men at the plant. This is lowering costs, increasing production and earning greater dividends for all of us.

Industrial democracy has given us our say in the management of the plant; it has given us insurance and a lunch room where we can get good meals for twenty cents; it has reduced our working hours per week from fifty-three to forty-eight and is teaching English to our foreigners; last, but not least, it has taught us that the management has worries just the same as we have and that by working and coöperating together we all benefit.

In most profit-sharing plans the workers never seem to understand the inevitable variation in the company's percentage of profits. It is also true that employees see an injustice in their being made to suffer for losses

resulting from bad sales, poor financing and unprofitable merchandise investments, all of which are beyond the workers' control. Men who labor want their share of the earnings now; not some day in the indefinite future. When dividends come along in the pay envelope it soon happens that the employee grasps the connection between what he gets and the idle machines caused by shirkers or inveterate holiday seekers.

Only the future will tell to what extent industrial democracy can be applied to the nation's business. Certain authorities say that the basic principles can be made to fit any organization. The disturbing question in the minds of many employers is: "Will not such a plan undermine my authority?" In answer to this one manager replies:

In our case industrial democracy has not in the slightest impaired the authority of the employer. On the contrary our authority has been strengthened by reason of the fact that no important action is taken without the approval of the employees through their representatives. As a result of democracy we find that any one of our workers who is inclined to be troublesome has to reckon with the full force of the opinion of his fellow-workers, and, believe me, this is a factor that possesses quite some persuasive power.

Workmen's Committees. In a number of instances perfectly plausible plans to bring about harmonious relations between employers and their employees have proved to be failures for no other reason than that both parties have ignored the fact that great industrial changes can only be brought about with safety through the slow process of individual education. Success has come most surely to those corporations where work-

men's committees, organized to represent the mass of employees, have been given limited authority at first, and then after a time of education and trial, the scope of the committee's powers and work has been widened until the men, through their representatives, have had a voice in matters of management as well as in matters pertaining to employment conditions. Going too far on the first throw has caused many plant owners to gather the idea that the majority of employees are unappreciative and irresponsible, and has caused the workers in various industries to entertain the belief that affiliation with radical organizations is the best way to safeguard their interests.

While no one plan or method of procedure can be said to be a panacea for all of to-day's business ills, the most talked-of schemes affecting our commercial life are nearly all one form or another of industrial management wherein the men and women employed have a voice and vote in the conduct of the company's affairs. While America has not yet developed any kind of an industrial system as ambitious along democratic lines as the schemes now being introduced in England and Germany, the plans inaugurated here in the United States during the past few years record a long step forward in the matter of establishing justice in our industrial relations. One large American corporation was early in the field and established a system of industrial democracy eight years ago. A recent survey covering the action of this plan showed that the men were receiving higher wages, working fewer hours, and enjoying more satisfactory working conditions. Labor turnover has been greatly reduced, and no important misunderstandings have occurred.

The plan has developed creative instinct in the men, and the amount of individual production has materially improved.

Labor's Attitude toward Industrial Democracy. So-called "industrial democracy" has not made a hit with all classes of labor leaders. Most of the union organizers maintain that the greater number of plans now in force only allow the workmen to take part in management under direction, and do not give him authority over, and responsibility for, the methods used. To a certain extent, this criticism is true; but it is a fact, nevertheless, that the most up-to-date managements are adding to the authority given the representatives of the men, just as rapidly as the workers prove their ability and are willing to accept responsibility. In more than ninety per cent. of the cases on record, industrial democracy has increased good will and coöperation. Its chief failures have occurred when an effort was made to apply the scheme to an unintelligent class of labor.

The corporation manager to-day who is of an investigative turn of mind has quite an array of facts before him, all based on actual experience, and most of them containing points of value to the fellow who is earnest in his desire to improve conditions in his own concern. One very successful company owes a large part of its prosperity to the old-fashioned idea of the company's president, that the employer and his men should live and work together. The homes of the company's officers are located alongside the homes of the corporation's employees. In the factories, there is a strict observance of all the lines of authority; after work, throughout the town, the whole population are merely

citizens together. The tennis courts, swimming pools and recreation centers are all used for the families of employers and workers alike. None of the sports are supervised, and all of the people meet on an equal social basis. Most of the workers do piece-work, and after paying 7 per cent. on the preferred stock, 7 per cent. on the common and 3 per cent. to the reserve, the company splits the balance of the surplus on a fifty-fifty basis between the workers and the owners of the common stock. A lot of people will laugh at the practicability of this plan, but it has enabled the corporation in question to become one of the largest companies in its line of business, and it is worth noting that the concern has passed thirty years without any kind of a strike in its works.

Successful Industrial Plans. Boiled to the bone, here are some other schemes that are now in actual use and producing satisfactory results. A company established an industrial relations department the manager of which was vested with authority to act as the president's representative and listen to all grievances or suggestions. The whole plan was based on the idea that it is human nature for a man to want to talk it over with his boss. Under no circumstances would the company permit any worker to suffer for his frankness in expressing himself. No employee can be discharged by a foreman until the matter has been taken up and approved by the industrial-relations manager.

A large manufacturing corporation is much satisfied with its new industrial plan, wherein four committees serve with the management. A service committee handles all of the entertainment, lectures, etc., given in connection with the noon luncheons served the men.

A shop committee hears all grievances, while a suggestion committee receives ideas for improvement and awards prizes of from five to fifteen dollars for all suggestions adopted. There is also a rate committee that confers on questions relating to wage scales, hours, prices, and piece-work.

One of the largest companies in the country calls each workman who has been in its employ six months an "industrian." These industrians elect a senate of twenty members who have had five years or more of service, and forty representatives who have had one year or more of service. A two thirds vote of this congress will overrule the factory manager's veto of any act passed by these representatives of the workers. The plan has given the men a Saturday half-holiday, better wages and hours and a merit-rating system. The company has profited by the establishment of permanent rotating shifts, and an attempted strike of a certain group of workers was promptly broken up by the men themselves.

Among the most satisfactory plans are those based on a policy of full publicity in the way of making known to the men all details concerning the company's earnings and finances. The concerns that follow this scheme see that their financial report to employees is stated in simple language, easily understood by the most uneducated worker. Dividends are referred to as "rental" for capital. Figures are given to indicate how much greater is the total amount of money paid out in wages than is appropriated to cover the cost of using money. Plain examples are cited to tell how the corporation's funds became tied up in investments for machinery, and accounts receivable. It is further explained that

as a consequence of this tying up of money the company can protect itself and continue its operations only by taking great care to set aside a modest reserve fund. Such a report at the present time is incomplete if it fails to call attention to the fact that the buying power of the dollar in the employee's pay envelope has not shrunk any more than the buying power of the dollar that belongs to the fellow who has invested in the business. The conclusion should be stated that business success and resulting high wages are dependent on the company's ability to supply an adequate amount of working capital. No one can be persuaded to invest money in a business unless the money will draw a reasonable living return.

Coöperative Associations. One company encouraged its employees to form a coöperative association, designed to improve their conditions and protect their interests. This association of workers did something a little unusual in electing a business agent who is not only general attorney for the men in their relations with the management and among themselves, but is chairman of the shop committee and has full authority to act as the representative of the men before the company's joint council. This agent is paid by the employees from the treasury of their association, and receives no compensation from the corporation, and is in no way connected with it. He has full access to the factory records, and therefore is in possession of facts that render it possible for him to make just and intelligent decisions on all questions brought to him. It is to the credit of these workers that they selected their agent from among the company's employees, and refused to place their interests in the hand of an outside professional organizer.

Employees' Advisory Board. It is difficult if not impossible to pick out any one system of industrial democracy and hold it up as an example of the one plan that is best under all circumstances. Conditions differ radically in certain industries and in various localities. A system will work satisfactorily with high-class labor and fail utterly when applied to a group of unintelligent workers. A great corporation in a Middle Western State desired to get in closer touch with its men in order to secure advice and suggestions from them. The scheme adopted was to establish an employees' advisory board which was created for the purpose of engaging in frequent conferences with a similar board made up of the company's officials. In order that the delegates of the employees should be truly representative, the company's forces were divided into twenty groups, of two hundred employees each. One representative is elected to the advisory board from each division. No company boss can vote for a representative or hold a position on the employees' advisory board.

In a number of cases companies adopting industrial democracy have reduced the number of meetings of the committee, board, or other bodies representing management and men, from once a week to once a month, and in some instances to once every three months. In most such cases, there remains the privilege of calling a special meeting at any time on short notice. One concern started with a plan of awarding dividends to its men, which dividends were based on records of departmental production. This same company changed its policy and is now having better success with a scheme that calls for a 10 per cent. bonus on the wages paid each worker. In addition to this bonus, 1 per

cent. is added for each year's service up to five years, making it possible for the older workers to receive as high as 15 per cent. in addition to their regular wages.

Corporations in various industries where operations heretofore have been seasonal in character have made considerable headway during the last year or two in rearranging their production on a 52-week basis. The better understanding between employers and employees now existing in many companies is permitting these concerns to solve their seasonal problems and largely eliminate the plan of laying off groups of workers during dull periods. In several cases where manufacturers attempted to take on off-season work, of a slightly different nature from its principal line of production, the workers met the company half-way by making temporary concessions in wages, thus enabling their employers to meet the additional expenses incurred in selling and distributing the new line of goods. One company that formerly worked less than 40 weeks a year adopted such a plan of acquainting its workers with the manufacturing problems of the concern, and as a result of this action secured such sympathy and coöperation from the men that the plant is now able to work on a full-time schedule, and the employees are earning from 10 to 20 per cent. more than they formerly received.

Union Coöperation. One of the hopeful signs of the times is the growing number of instances where labor unions are coöperating with employers along constructive lines. In one large city, all of the workers comprised in the membership of half a dozen locals recently indorsed scientific management and went on record as favoring all reasonable plans to increase

output. All of the employers in this particular industry located in the city on their part have undertaken to eliminate idle periods. In the get-together between the owners and men it was decided to employ an independent firm of industrial engineers whose duties would be to analyze the industrial situation and make suggestions concerning hours, wages, operating methods, and wasteful practices. In this unusual case, where the employees have joined with the management in employing a firm of so-called scientific engineers, the annual fee of the official experts is divided equally between the management and the men.

An extremely important lesson may be learned from the experience of one large city, where all of the local labor unions joined hands with the employers' association of the same city to banish strikes. The agreement between the men and their employers binds both parties to submit any and all questions in dispute to arbitration. The contract is specific in stating that there shall be no walkouts, lockouts, boycotts, or strikes. The arbitration board, composed of seven members, has two representatives from the employers' association and two from the union. The other three arbitrators can in no way be connected with a faction of the employers or employees. The four members representing the managements and the men are really only advocates for the interests of their respective sides, while the three neutral members of the board are actually the arbitrators. It is specified that in all cases the labor year shall commence on the first of April, and demands from both factions must be submitted before January 1st and satisfactorily settled no later than the first of March. All agreements remain in effect for at least one

year, and it is plain, therefore, that labor controversies occur in only two months of the year, leaving the other ten months free from labor disputes. By giving the other side written notice of its desire sixty days in advance, either party may have the opportunity on April 1st to alter an agreement. Several cities are now working on plans of a similar nature, and this may add to the number of "strikeless" cities here in the United States. A plan that has proved so satisfactory in one community over a period of several years can certainly be duplicated elsewhere.

There are a number of cases where labor unions are now entering into agreements with employers whereby both parties guarantee that they will not restrict output or enter on any action that will injure the other. In practically all of these instances it is stipulated that production engineers are to be engaged to determine the fairness of all demands. All expenses of such investigations and adjustments will be equally divided between the employers and their employees.

All of the work of the unions is not now being devoted wholly to the consummation of satisfactory working contracts with employers. In many places the labor organizations are doing effective work to reduce the prices of life's necessities to their members. One big brotherhood of railway workers has gone into the business of manufacturing gloves, hosiery, overalls, and underwear, which articles are being sold to its members at prices twenty-five to sixty per cent. below current retail prices. All raw materials are purchased direct from the producer, and goods are sold to the men through mail-order and retail stores. Plans are now being made for a large extension of this scheme in the

manufacturing field, so that shoes, suits, hats, and canned foods will be included in the list of articles produced. The big union that started the movement has been assured of the support of other large labor organizations, and reports tell how many millions of dollars will soon be available to carry on this effective form of battle against high costs.

In many fields, especially in coal-mining districts, labor-union stores are fast taking the place of the older company stores. The time is rapidly passing, if it has not already gone, when workers can be forced to spend their earnings for the high-priced goods often dealt out by company commissaries. There are now several instances where the demands of employees have forced manufacturers to move their plants to other cities or States. In several cases of this kind the employees who have been left behind started a competitive business on a coöperative plan. These ventures will settle the interesting question as to whether or not such groups of employees can develop from among themselves sufficient managerial ability to make their ventures successful in the face of the keen competition they must meet.

Kansas Industrial Court. Of all the recent solutions that have been proposed for labor difficulties, the Kansas Court of Industrial Relations has been the most talked-of. The dangers threatened by the last coal strike in Kansas caused the legislature of that State to enact a law to protect the interests of the citizens. The bill abolishes all forms of strike, and authorizes a court composed of three men to decide disputed questions. This permanent tribunal has the power to regulate, and in emergencies, operate any or all indus-

tries when the public welfare demands it. It has authority to investigate wages, hours, and working conditions, and can issue orders in the interests of the public. Recognition is accorded the right of collective bargaining, and although any individual or company dissatisfied with the ruling may appeal to the Supreme Court of the State, no individual or group of individuals may enter into a strike, lockout, or conspiracy to handicap production or transportation of essential products. The court may serve as a board of arbitration for other than essential industries on the request of ten persons affected. It must also give careful consideration in the case of any controversy to a petition of a group of taxpayers demanding remedial action. This Kansas law is the first legislation passed in any American State compelling employers and employees to settle their differences without resort to a strike or a shut-down. When the public interest demands such action, the court may order a business continued or taken from the owner. Individuals who disobey the law are subject to a fine of a thousand dollars or one year in jail; for labor leaders or corporation officials, the penalty is five thousand dollars or two years in jail, or both. The court is founded on the following principles: A fair wage for labor and a just return for capital; all industries subject to the law must be enabled to continue in operation with reasonable efficiency and for the purpose of promoting the general welfare.

From the foregoing it is quite evident that all classes of people are giving active thought to ways and means for smoothing out the rough spots in our industrial relations. However, notwithstanding this concentration of effort, labor is still earnestly trying to convince

capital and the public that the principle of the closed shop is in accord with American ideals. The majority of our citizens, however, still adhere to the idea that although labor should have the right to unionize, any individual worker must also have the right to remain an independent employee. There is also a strong movement to accept the idea that the right to strike should not be conceded to collections of individuals engaged in the production of our daily necessities.

Believing that there is too much militancy and not enough hesitancy in settling labor unrest to-day, certain of our large technical universities are now offering their services in a consulting capacity to manufacturers and others who are in need of advice on matters that are not only scientific, but simple. Hundreds of corporations lack departments for research, both in matters technical and economic.

Chambers of Commerce in several cities are working along the right lines in appointing a committee to collect helpful information concerning management methods, bonus systems, profit distribution plans, and other schemes intended to advance the welfare of all classes of business. A committee of this kind can have access to the reports showing the results of all local companies and from this mass of information a really constructive survey, including a model labor-handling plan, can be formulated and submitted for the use of all local business concerns.

Few people in America are now laboring under the belief that the labor situation is in any way satisfactory or half as good as it can be. Yet there are a few bright spots on the horizon, one of which is a recent wide investigation which indicates that the general

efficiency of American labor is again increasing. This particular survey shows that old labor is as efficient as in pre-war times, while the chief trouble in the matter of low productive capacity is with new labor.

Great good is sure to result from the growing thought that honest publicity will soon supplant the strike as an effective agency in settling labor troubles. Agitators and walking delegates who use the strike as a meal ticket will continue vigorously to oppose the coming of a "strikeless" age. It is not likely, however, that this selfish resistance will prevent the establishment of a new order that will preserve the institution of private property and at the same time provide a just reward for all classes of producers who are willing to put forth a reasonable effort under working conditions that foster health, happiness, and the individual's initiative.

A New Departure in Plant Operation. If the only way we can again recover our economic freedom is through a larger output of the essentials of life, then all methods that are being employed successfully in bringing about a higher rate of individual production in any industry are of great interest to us. Out in Ohio is a big motor-manufacturing corporation that since 1914 has increased wages 120 per cent., purchased its raw materials at an advance of about sixty per cent., and yet is selling its product for an advance of only ten per cent. If this does not indicate that the management is pretty near right and the men are pretty near efficient, then some sharp mathematician will have to show otherwise. The management is opposed to piece rates, bonuses or premiums, and profit-sharing. The company's policy is to stick strictly to the hourly rate of pay.

The plan that is being followed by this corporation is

spoken of by many people as being somewhat radical in its nature, but the results obtained are so favorable that the system employed is deserving of careful consideration. All that the company attempts to do in its factories is for the sake of morale. The fact is entertained that production depends upon the morale of the workers and that if this can be maintained the dollars-and-cents profit will take care of itself.

The management started its new departure in plant operation on the primary assumption that the workers must have implicit confidence in the management. Throughout the country are groups of people who have lost confidence in many of those things with which they are most vitally concerned. Thousands of workmen have lost faith in their labor organization. Hundreds of college men have lost confidence in our present system of education and the value of learning. The feeling is quite general throughout the nation that most people are concerned greatly about their own personal welfare and very little about the common good. Practically all our unrest at the present time is caused by a lack of confidence.

Before it is possible to create confidence on the part of employees in the management it is necessary for the latter to show beyond doubt that it believes sincerely in the men. In conformity with this principle the production manager has acted with such frank honesty that suspicion of all company motives has been eliminated. He has convinced the men that their success depends on the kind of future they build for their company. Since wages and morale are inseparable, a high rate of pay was established. The employees were shown at the start that their wages were as high as the

business would bear, and in order for them to get a higher rate it would be necessary for production to increase.

In the matter of working conditions the men were dealt with squarely, all cards being placed on the table face up. The factory buildings are kept clean and are supplied with modern sanitary facilities, good air and water, and a well-equipped hospital, while the employees' restaurant serves pure, wholesome food. The working hours are reasonable and no discrimination is practiced against any nationality, creed, or organization. Preference is shown to married men above thirty years of age and to men living in the community where the plant is located. A committee system is in force in the shops to insure a fair deal for the men and to keep the company policy directly before the employees.

All the circumstances concerning any worker who quits or is discharged are carefully reviewed to make sure that no injustice has been perpetrated. There is a monthly house organ which provides management and employees opportunity to express themselves. Provision is made for the training of ambitious workers who desire to advance to higher positions. An information bureau renders legal and financial advice to employees, also special information and records concerning Liberty Bonds, Thrift Stamps, income-tax reports, and so on. A benefit society is operated by employees to insure financial protection in time of sickness or death. Social and amusement features include a band, orchestra, baseball team, an annual outing, dancing, and other sports in season.

The officers of the company hold the idea that pro-

duction is the greatest essential in a factory. For the whole community to maintain a comfortable and humane standard of living it is necessary for every man in the community to produce consistently, otherwise there will not be enough wealth to go round. The policy of this concern harbors no fear that over-production is a menace. Even the men believe that the term "over-production" is merely a negative expression of "under-consumption." In establishing a wage scale the two important factors considered are cost of living and amount of production. In determining the number of working hours the points considered are the relation of earnings to living cost and the relation of the hours worked to the health and happiness of the employees.

The work of the committees that represent the various groups in this company is mostly educational and in no way governmental. The management of the corporation realizes fully that vicious radicals are busy spreading the idea among industrial workers that the employee himself receives only about one tenth of what he produces. This false propaganda is vigorously combated. An effort is made to explain to each workman exactly what he produces and just how the labor of his hands is distributed. The total expenditures of the company for each year are divided into six groups, and an effort is made to point out how the company and the industry served are endangered through slighting any of the six items enumerated.

In the company's most recent report to its men the expenditures were grouped under the headings: Taxes; reserve for contingencies; maintenance of plant; expansion of plant; wages, salaries and dividends, and expenditures for materials and supplies. When the workmen

of any company have such complete figures before them there is small likelihood that any radical or trouble-maker will get far in his effort to convince the men that they are getting only ten per cent. of what they produce. The company manager or some high representative of the company goes before the committee representing the workers at least four times a year and points out the important facts in the company's financial progress and accomplishments.

In line with its modern methods of operation the corporation has established certain principles for itself from which it refuses to depart. It believes and states that capital is always production and consumption. Business originally was founded on service. The customer pays all—the public suffers all. Absentee ownership may or may not be a curse. Absentee management is always a curse. No alliances; free speech; free press; recognition of individual rights; wages based on buying power, and the production of an article that is a necessity. Dividends paid by the company are limited to eight per cent. on the capital stock.

Such are the general principles and operating schemes of this Ohio company which declares that the industrial difficulties of to-day and the future will be between management and labor, not capital and labor. Perhaps there are other plans for relieving present social ills in industry that are as good as those just outlined—or better—but in view of the absence of bonuses, profit-sharing and any form of industrial democracy the results obtained are striking. In 1918 the men produced 2.72 trucks per man; in 1919 the output per worker was 2.95. Expressed in another way, the productivity per man increased nearly 10 per cent. last

year. This splendid accomplishment was posted so the men could see it, and credit for the results was given as follows: One third due to ample capital and plant and methods of manufacture; one third to management; and one third to the men voluntarily giving an honest day's work.

A Unique Idea in Industrial Organization. Of all the problems that confront employers to-day none is of greater importance than a thorough understanding of man himself. Labor unrest, low wages, and general inefficiency are caused largely by the failure on the part of employers to study and understand the structure and operation of the human body. It may prove of profit in this connection to present for careful consideration a brief digest of an interesting idea of C. E. Knoeppel, one of our prominent industrial engineers. He starts with the assumption that the most effective type of industrial organization is that which can produce the greatest net results in the easiest possible way and in the shortest possible time. The human body is the best example of organized control that can be found in the world. Its component parts are of a finer kind of design than we shall ever approximate, and the functions and their relations are coördinated more smoothly than we shall ever be able to arrange human relations.

Mr. Knoeppel believes that we should pattern our industrial organization after this perfect model, with the full expectation of securing both economy in the expenditure of energy and efficiency in the attainment of results.

The principal aim of the human body is economy in the expenditure of bodily power and energy required

to secure the attainment of efficient results. A careful study of the body as a mechanism, as an organism, and as an organization, points out many lessons that may be applied in our industrial life. First is delegation of authority. Regardless of from which point instructions are received, the brain decides and then delegates the task to be done to the function or functions designed to perform the task. The body is run by experts.

The heart does not attempt to breathe, nor the stomach to carry blood from place to place. The ear does not make an effort to see nor the tongue to smell. Everywhere the work is done by specialists. There is centralization; the body does not tolerate lines of divided authority. There is no indecision as regards what is to be done—each organ acts definitely and promptly.

In the operation of the human body there is no passing the buck, and there is no butting in by major officials in the work of other major officials, nor in the work to be done by minor officials. The body is a “we” proposition and not an “I” affair. It concentrates, placing within a function all the factors that affect its performance. Fingers are not under the jurisdiction of the lungs, and the stomach is not ordered about by the heart. There is no element of know-it-all by the major officials of the body. Advice from all sources is given respectful attention and acted upon immediately. At precisely the right moment the body transfers work.

The Bible says: “Go to the ant, thou sluggard; consider her ways, and be wise.” Mr. Knoeppel suggests that a similar truth may be stated with reference to organizing for work: “Go to the human body, thou

searcher after truth; pattern after its workings, and be efficient." If man is organization, then organization is man. The inefficiencies we are constantly in contact with are in the last analysis the result of faulty or incorrect organization, and sometimes a total lack of organization. Faulty organization is cursing us now because we have no plan and do not get down to fundamentals. Industries flounder along on one or two cylinders, and capital and labor fight because neither fully understands the facts upon which good organization must rest, nor the theories round which good organization must be developed.

Management may be defined as the wise use of coördinated knowledge. There would be a grand mix-up if the performing machinery and the service machinery of a corporation were all merged under a single head. This would be the same as if the hands and feet and heart and liver were part of the same function. It is not difficult to imagine what would happen to the human body if the hands and feet had to wait until the heart pumped a certain amount of blood or the stomach digested a definite quantity of food. In an efficient industrial organization, just as in the human body, routine performance must proceed unhampered and without interruption. Service must be rendered and requirements anticipated. The two must be directed and coördinated by some agency which can rely for information and advice on experts or specialists who are in possession of the required knowledge to reason, conclude, and act.

The body organization is governed by laws of health and Nature. If we do not sleep, or will not eat, or stop using certain muscles and faculties, there is soon a

bodily disarrangement that causes trouble. The same applies to industrial organization. When laws are violated, disarrangement follows and the result is confusion and waste. For instance, among the several laws set down by Mr. Knoeppel as essential in the operation of a business corporation, that with respect to the placing of responsibility seems to be quite important. Each worker must be held responsible for certain results, and should have full authority to get them in his own way. Too often we adopt detail-chasing tactics which develop leaners, instead of man-building methods which develop doers. Executives should give their subordinates absolute authority to do things falling within their sphere. Employees should be held responsible for results rather than for methods used; and if a policy of giving full credit is adopted by the highest officers, the same policy will soon extend down and permeate the whole organization.

Whether or not everyone agrees that the best opportunity to develop an ideal industrial organization lies in applying to our business life lessons derived from a careful study of the human body, it is an interesting thought, well worthy of investigation and experiment. It has not been the purpose here to go into this problem in any exhaustive fashion, for that has been done by those who are advancing the idea. No one will deny, however, that some of the greatest advances of science have come through first studying and then attempting to imitate the marvelous handiwork exhibited by the Master Designer of the universe.

If one organ of the human body, such as the eye, has given us the basic knowledge needed in the development of a wonderful photographic apparatus, then why

may we not obtain the design for a splendid industrial organization from the methods of control and the plans of operation laid down for the government of the world's most complicated machine?

A Human Laboratory. Not all employers can afford to undertake costly experiments in humanics, but everyone can profit by the researches and results of others. One large insurance company in the East has been conducting a human laboratory, using its 21,000 employees as material for its experiments. The knowledge it has gained will doubtless prove of more than passing interest to all employers who seek to create a spirit of harmony and coöperation between their employees and themselves.

The main purposes of this company's efforts have been, first, to strengthen the human relations between the company and its employees; second, to increase the permanency of the working force in order to secure loyalty and interest on the part of employees. The welfare work of the company has developed two fundamental operating principles: 1. Welfare work or betterment work must be in addition to wages and not a substitute for it. 2. No efforts to assist the individual worker must interfere with the right to live his or her life without undue interference.

So much of value having a direct bearing on industrial relationship has been developed by this company that the many successful plans introduced for the betterment of its employees would stand duplication elsewhere. Though intended particularly to benefit its large staff of office workers, the fundamental principles underlying the company's welfare work can be adapted to conform to requirements in many industrial plants.

The ideas given in the following paragraphs are based on the company's present practice.

Working Conditions in Offices. Primary among any concern's plans to better the working conditions of its force should be the efforts to improve the ventilation and sanitation of the workrooms. Gradually the tendency is becoming more prevalent to increase the size of these rooms. Partitions should be done away with. All rooms should have natural light from two sides, and the rule should be to eliminate as far as possible all need for artificial illumination. Semi-direct lighting has been found to give the best results.

Five-minute rest periods for the office staff, wherever the plan was first undertaken as an experiment, have been extended generally. During the rest periods windows should be thrown wide open and the clerks encouraged to engage in active exercise. It has been established that this practice has removed the strain of the last hours of work in the morning and afternoon periods.

Employees' Entrance Examinations. Wherever many hundreds of employees are engaged, an entrance examination for workers has more than repaid for its expense in the results achieved. In the insurance company earlier alluded to, the examination includes a psychological as well as a medical test. The former measures the mental ability of the applicant and is based on the psychology of association, reaction, time, and so on. The medical examination, which is a thorough one, includes a report on family and personal history, an investigation of heart, lungs, sight, hearing, and teeth.

If examinations such as the foregoing are carried out intelligently and conscientiously, they will result in the

securing of men and women who are physically and mentally fit. It has been found beneficial, to employer and employee alike, wherever the plan has been adopted, to subject the workers to an annual medical examination. The purpose back of such an examination is fourfold: First, there is the desire to detect disease in its incipient stage; second, the correction of ascertained minor defects; third, encouragement of treatment; fourth, the prevention of disease.

So that it may better look after the physical welfare of its people, the company here taken as a model has established a rest room (or what might more properly be called an office dispensary), an optical clinic, a dental clinic, and a tuberculosis sanatorium. With the exception, perhaps, of the sanatorium, which is quite an ambitious undertaking and has been made possible only because of the many thousands of persons in the company's employ, similar health-conserving arrangements may be adopted with advantage by other concerns, great or small. In addition to rendering emergency medical care to the employees each day, a rest room may be used as a place in which to carry on many helpful activities.

An optical clinic may be held as often as is deemed advisable, depending on the number of employees. Here refraction tests can be made and dispensary work done. Arrangements should be made for an optician to come at stated intervals, say once or more a week, to fit and adjust glasses, which should be sold to the employees at cost.

A dental clinic held at certain intervals will save days of time for any large company. Analysis of records show marked relationship between attendance

and efficiency on the one hand and tooth infection on the other. Assuming as an average that each case treated would have lost one quarter of a day if the individual had been obliged to go to an outside dentist, the actual saving to any company with its own dental clinic may readily be determined.

It is becoming more prevalent for large companies to serve a complete noon-day luncheon to all employees. This is not being done with the sole idea of benefiting the worker, but rather for the purposes of increasing the efficiency of the individual. It was found that many clerks who have need for strict economy effected considerable of their savings by cutting down in their luncheon expenses. The plan now followed eliminates this danger. The mid-day meal furnished by the respective companies is not a gratuity, but is considered only a supplement to the wages received. Economical and yet wholly satisfying menus can be worked out by a competent dietitian.

Encouraging the Saving Habit. It has been found that men and women who are not saving money are the ones most likely to be dissatisfied. Many concerns deliberately set about making their people save. One company has adopted a plan whereby a staff savings fund was created. The company deposits to the benefit of each employee an amount equal to one half the deposits made by the employee during the current year. The company's deposits may be drawn out in case of the depositor's death or permanent incapacity or by vote of the trustees in the event of honorable retirement following twenty years' continuous service. The employee's deposits may be withdrawn at any time, but in such case the company's contributions

stand to the credit of the remaining depositors. At the end of 1918 the staff savings fund had 7901 depositors with credits to their accounts totaling \$4,122,367, of which the company's subscriptions with interest amounted to \$1,729,729. The average rate of interest earned on the total deposits according to the latest records is 5.16 per cent.

Other things worthy of consideration are schemes for disability insurance, plans for the retirement of aged and disabled employees and wide provisions for recreation and education, the excellence and practicability of all of which are attested to as follows by one of the vice presidents of a company that has put them all into effect.

We discovered years ago that increasing people's pay will not keep them with you. They must get more from you than is furnished in the pay envelope. Our work is a deliberate attempt to cut out the expensive evil represented by a large labor turnover. That we are succeeding in our aim is shown by our results. We are not only getting the right kind of people in our employ but they are staying with us, and what is more they are mostly satisfied. Half of the employees of our big home office have been with us for a period of five years or more. We know that the amount expended in our service work for employees is justified. Our records prove it brings large results in increased efficiency and in the permanency and loyalty of our working force.

Encouraging Home Ownership. Investigations have disclosed that the highest degree of unrest is among the non-owners of homes. Thousands of employers are largely responsible for this situation. Hundreds of

great industrial concerns have neglected the biggest opportunity afforded them to create stability and loyalty in their employees by failing to furnish their workmen with a practical plan for acquiring homes. The man of family who owns the roof over his head is not only a better citizen, but is generally barren ground for destructive, unsound propaganda.

There are numerous experimental plans being carried out in various parts of the country, having as an object the ownership of homes by employees. One such scheme is being developed in Cleveland. A number of progressive business men have formed a realty underwriting company and have drawn up a plan whereby local industries may avail themselves of the service and arrange for their men to acquire homes by a bonus plan. The scheme is so devised that the workman participates in the plan on a competitive basis in such a way that production, efficiency, and initiative are stimulated.

The realty syndicate offers each company a large number of home sites on an attractive partial payment and building financing plan. In turn the industrial or commercial concern allots these sites to those of its men who have earned them by competitive means.

The general scheme is for the local corporation to offer each employee who has been in the company's service for sixty days an optional right to subscribe for a lot on which the company has made an initial payment. After one year's service this initial payment becomes an outright credit in the workman's favor. There is another credit for two years' service and a third credit for three years' service. In addition, the men generally get monthly credits as follows: For the best mechanical suggestions; best health suggestions; best ef-

iciency suggestions; best safety suggestions; and best advertising suggestions. Finally there are semi-annual credits for attendance, credits for employees in each department that shows a certain increased percentage of production for a stated term, and credits for men in any department that shows a certain percentage of shrinkage in waste and spoilage for a stated period.

The arguments set forth to prove the desirability of such an own-your-home plan are based on the contention that this scheme means more to the employees than if the money reward were paid as a cash bonus, because money spent is soon forgotten. The plan is more attractive, because it will be a daily reminder to the man and his family of the company's good will. The scheme promotes saving and encourages thrift, for though the concern is supplying valuable credits that help reduce the employee's indebtedness for his home, the man himself through his earnings must help to defray the cost of the house. Labor turnover is in this way materially reduced, for home owners do not move so frequently as renters. Every new man that must be trained represents a real loss to the company.

In this important matter of encouraging workers to purchase homes a rather unique plan was recently initiated by one of the country's largest insurance companies. The scheme now being put in force provides ten-year six per cent. mortgage loans on desirable home properties throughout the United States. The loans are repayable in a hundred and twenty equal monthly installments. Life insurance to the amount of the loan is required as collateral security to protect the dependents against the burden of the debt and to protect the company as mortgagee. The monthly

installment includes interest, life insurance premium, and a payment on account of principal.

Death is the chief hazard to which purchasers of homes are subjected and is perhaps the main cause of foreclosures. With the plan here described the mortgage will have been paid and the home left free and clear at the end of ten years. If death intervenes during the payment period, the mortgage is paid immediately by the life insurance, and the insurance money in excess of the debt is paid over to the beneficiary. It is much better to inherit a home to live in than a mortgage to struggle with.

The benefits of such a scheme are numerous. An ordinary mortgage may fall due or be called in at short notice. In times of financial stress money lenders often ask payment in full at maturity or demand heavy payments on account. Frequently the borrower may not be able to replace the mortgage, which may result in the loss of his property and savings. Or if other funds can be obtained at such a critical time the lenders will likely charge exorbitant commissions and high interest rates on the new loan.

Furthermore, in the ordinary purchase of a home the necessary costs of examination of title, appraisal, survey, and so on, are a considerable item. Generally the borrower bears all such expenses, but in this plan the insurance company assumes the burden. The scheme also permits prepayments after the loan has been in force three years, so that the borrower may clear up his debt in less than the prescribed ten years if he so desires.

One of the crying needs in the United States to-day is not only for more homes, but for a larger ownership of

these homes by the great mass of citizens. There are many other practical home-owning schemes in operation besides those here touched upon, but the purpose has been to convey the thought of possibilities in a neglected problem rather than to present a finished discussion of a detailed plan, which, after all, could never be designed to fit every case. Not every large employer has put forth a maximum effort to encourage permanence, thrift, and contentment in workmen by aiding them to purchase their own homes. There could be no Bolshevik movement in this country if every householder in the United States owned the residence he lives in. This is a problem not only for large industrial concerns, insurance companies, and real-estate organizations, but for the leading citizens in every community in every State.

Idleness and Production. Human nature is so complex that regardless of the incentives furnished for sustaining a worker's interest in his job there are many men and women who are prone to the habit of taking a day off every once in a while. Absenteeism of this sort is not only demoralizing in its effect on the rest of the workers in an office or plant, but quite often it decides the management to pursue a policy of selfishness, in the belief that the workers in general have no interest in their jobs outside of the weekly pay envelope; that they have no sense of responsibility; that they do not concede that there is a duty they owe their employer. Where this blind attitude on the part of employees exists it can be cured by education of the proper sort. The workers can be made to see the situation in its true economic light.

Women lose slightly more time from their work

than do men, which is due principally to the fact that the female worker is more susceptible to illness and has more home ties. People who work at night lose more time than do those who work during the daylight hours. Loss of time is greater during the winter months than it is in the summer season. Climate has considerable to do with absenteeism, as is proved by the fact that workmen get in more hours on the Pacific Coast than they do in New England, where the weather is a bit more rigorous.

The loss that the nation suffers through absenteeism cannot be calculated with perfect accuracy. However, a sufficient number of investigations have been made in this country and abroad to enable one to make a fair estimate. If we assume that the possible number of days that may be worked each year are 300 and that the average amount of absenteeism is seven per cent., it is then evident that the loss per person per year is 21 days. If we continue the calculation on the basis of 30,000,000 workers at an average wage of four dollars a day we find that the total yearly loss in wages amounts to \$2,520,000,000.

The country's loss through absenteeism, however, is more than a matter of dollars and cents. Idleness is not only one of the direct causes of labor turnover, but it is a demoralizing influence that tends to decrease the efficiency of the worker. Steady employment is something of an acquired habit, and the workman who loses the habit of strict application to his job soon finds himself on the way to becoming a member of that nomadic class of employees who are always seeking new fields of endeavor.

It is of course a fact accepted by all modern managers

that vacations of moderate extent are necessary and do not decrease the net productivity of the worker. The only kind of absenteeism that is here referred to is that unnecessary idleness that is not foretold and that leaves equipment and machinery unmanned. In such cases the company has to bear an overhead expense with no return whatever. If a less competent workman takes the place of the absent employee, the result is a reduced output. When absenteeism in any plant becomes a matter of moment the company then finds it necessary to employ a considerable clerical force to record and handle the absences. If men work in groups the absence of one individual will often decrease the efficiency of all those who stay on the job.

Our leading authorities say that sickness accounts for about fifty per cent. of all the absences that occur in American industrial plants. This means that the average American workman loses a little more than ten days each year because of illness. Better attention to lighting, ventilating, sanitation, home surroundings, and general welfare will materially reduce this kind of absenteeism if earnestly undertaken and effectively carried out. Insurance records show that no less than 75 per cent. of all accidents of an industrial nature can be prevented if the proper precautions are taken. Something like 6 per cent. of all absenteeism is recorded as due to industrial mishaps.

The greatest opportunity to-day in the matter of reducing idleness, however, lies along other lines than those of welfare and safety. The investigations indicate that absenteeism is often encouraged by long hours. If men are employed on an eight-hour basis and still work ten hours the physiological effect is just

the same as it would be if the company had a basic ten-hour day. The fact that a bonus is paid for overtime does not change the situation at all. As to the matter of wages, one investigator maintains that if wages increase faster than the standard of living idleness is fostered.

Some of the methods proposed for the abolition of absenteeism are both interesting and practical. Monotony breeds absence from work, and it is suggested that this factor can be eliminated through making all tasks as pleasant as possible and through encouraging the creative impulse in the worker. There are several instances on record where employees had been in the service of certain companies for from ten to twenty years and had never met their employers face to face. It is not to be wondered at that in such companies there are inefficiencies due to a lack of interest and understanding.

It is generally understood that the first thing to do in commencing an attack on absenteeism is to establish an employment department, whose duty it will be to discover the causes that increase idleness among the men. Much care must be exercised in the investigation of absences. The best way to avoid exciting suspicion and rousing antagonism is to have all visits to absentees made either by a doctor or a nurse. The scheme works better if it is based on the assumption that the worker is ill.

In the old days managers sought to prevent absence and tardiness through the imposition of fines. Modern corporations have wholly abandoned this plan, having found that such a system of imposing penalties for lost time generally caused bitterness and acted to destroy

company good will. A better method is to reduce tardiness and absenteeism by paying a bonus for good attendance. Some companies pay from fifteen to fifty cents a day to all employees who have had a perfect attendance record over a specified period of time. In all of such plans it has been found wise to establish as short a period as possible for basing the record of attendance. The reason for this is that a workman who loses his chance for a bonus early in the period will generally lack interest in keeping up a good record for the rest of the interval over which the bonus is calculated.

One company employing such a system has inaugurated an additional bonus which is paid as a reward to the employee who stays with the company for one year. The whole idea of this payment is aimed at a reduction of the labor turnover. A number of concerns have found it possible to better their records of attendance by having contests between different departments in the company, the prize being a bonus for the winning groups of workers.

It is wrong to assume, however, that all of our labor ills can be cured through the payment of money. Workmen can only be induced to work steadily, efficiently, and with interest when there is confidence and coöperation between the men and the management of any company. Some years ago F. W. Taylor, known as the father of scientific management, startled the country with new ideas respecting the handling of men and the efficiency of the individual worker. H. L. Gantt became associated with Mr. Taylor and after the latter's death continued in his work as one of the leading disciples of this new gospel of industrial manage-

ment. Only a few months ago Mr. Gantt passed on, and the mantle of leadership in the art of management appears to have fallen on the shoulders of Fred J. Miller.

A company can only attain to a large output through eliminating the tight spots in its factories, Mr. Miller believes. These are the spots through which it is difficult to get the work so as to keep up with the rest of the plant. They are shown as often as otherwise by the necessity for working overtime on those jobs. It often occurs that two or three years must be devoted to the preliminary work of getting control of things in any plant where it is proposed to bring about conditions that are ideal, or as nearly ideal as practice permits.

Like most students of scientific management, Mr. Miller believes in the use of charts. In this way it is possible to show the capacity of every machine in the factory. One chart will show when each operation upon a lot of parts should be completed and the daily reports will show how nearly this time has been met. These records in each plant are generally placed in the hands of a central planning department, which bureau pretty much controls the factory operations. All foremen are thus relieved of the work of planning, which usually they are poorly fitted to do. This also does away with that method of factory management which might be called the system of browbeating by foremen, which tends to disturb the smooth working of any plant. System of this kind renders it possible for the factory executives to devote all of their time to doing real executive work; attending to emergencies, making improvements, and so on, with time enough for such work and with no hours demanded of them for disciplinary work. Dis-

cipline practically takes care of itself in factories and industrial establishments of all kinds that are scientifically managed.

In one large factory the records show that time study and bonus were applied to 4017 jobs, all of a different nature. Production on these jobs has been increased an average 65.5 per cent.; the average labor cost has been decreased 19 per cent. and the average wages of the people working on the jobs have been increased 24 per cent. These figures of course will differ according to the establishment where the system is applied. In getting results about as much depends upon where you start from as upon what you do after you start. In addition to the benefits mentioned above the plan permitted the shortening of the hours of labor, and allowed the company to introduce two rest periods of ten minutes each, one in the morning and one in the afternoon. The rest periods have resulted in an increase rather than in a decrease of production.

Careful study of a job often brings out some surprising things. Improvements of one hundred per cent. are not uncommon. Right here it should be stated that in any plant where it is proposed to make a study of the various tasks with the idea of establishing scientific management the owners should never attempt to force the issue with any workmen. If one employee declines to coöperate, another workman should be approached and persuaded that the plan will operate to his advantage, and the company should assure him that his earnings will be maintained. The man who did not like the proposition should not be discharged, and if he has to be transferred he should be given an equally good job. The success of all modern methods of manage-

ment depends very largely on the maintenance of the good will of the employees. Through the exercise of proper patience and tact the enemy of task and bonus work will be converted to a friend and defender of the method.

The time has come when foremen must no longer be drivers of their people, but teachers, leaders, and helpers instead. In the matter of deciding as to what is justice it is important to get the viewpoint of the workman and this opinion should be expressed without fear of consequences. When a company management refuses to discuss matters with the men it compels a resort to force and this tends directly toward the selection of fighters and trouble-makers instead of reasonable negotiators with whom something may be done.

We are all too much in the habit of regarding brick walls and the machinery and appliances within them as the important and essential things in a manufacturing establishment, and have paid too little attention to the human element and the great possibilities of its improvement. It is unfortunate that this human element does not appear in our company inventories. It may be demoralized or its value practically destroyed and no loss will be shown on the books or statements that guide financiers in estimating the value of an industrial establishment.

This is one reason why the problem of human relations in business has been so long neglected. It is one thing to read and admire the details of proper methods of management, but it is quite a different thing to go ahead in our business life and apply these principles to our everyday affairs. If a thing is right

it is also expedient and can be made to work if we will only go ahead fearlessly and keep sincerely trying.

Value of Educating Foremen. One widely accepted plan for improving working conditions between management and men is based on the idea that industrial stability is best assured by educating foremen in human relations and also in business economics. The champions of this plan point out that the foreman is the real non-commissioned officer in industry; he is the one person who is in direct contact with the workman, and it is from him the laboring masses obtain their impression of their employer. This being true, the argument is advanced that there can be no labor solution unless the minor executives are first trained by intensive methods. The contention is that every company proposing to adopt some form of industrial democracy should first see that all its foremen are thoroughly instructed in the primary economics of industrial management. Success is thereby doubly assured.

John Calder is a leader among those one-time managers who have embraced this idea. He contends that there is great peril in permitting vital questions to be fought out between ignorant change on one hand and ignorant opposition to change on the other. As we become better informed we are demanding more and more that all programs of reconstruction be submitted to the test of economic soundness. We can no longer live industrially in isolation. Employers and workmen in one plant and in one industry must fuse their efforts with owners and employees in other industries. There must be a plan that permits of self-expression and self-determination on the part of the workman in everything that touches his industrial interests.

Success can come only through the economies of specialized production. But to get this very essential result we must first establish a practical and satisfactory form of democracy in industry. We need never expect to get along without a certain amount of economic friction; that is the inevitable price we must pay for a democratic basis of existence, and the cost is not too high. However, the present is a time of varied and bewildering theories—so numerous and so complex that many executives are uncertain as to just what the average workman does want.

It is a mistake to attribute present unrest in labor circles to the great war. The recent conflict did intensify our problems, but most of the demands now being put forward by employees are based on old claims which heretofore had not been generally recognized and almost never conceded. Workmen now want to be treated as intelligent participators in industry and not merely as the sellers of a commodity. They want to be consulted, to have some things explained to them in the first instance, not merely thrown at them or arbitrarily imposed on them by bulletins or orders to which they were not a party.

Though many employers have comprehended this new attitude of workmen, there are still a host of owners who cling to the ideas of the last century and say: "Can't we do anything we like and adopt whatever methods we choose in handling the things that belong to us?"

The answer is that there is no law forbidding an owner to follow such an independent plan, but if he is wise he will see the folly of playing a lone hand with the interests of others, for no important business to-day is a one-

man affair—the public and the State must be considered as well as the management and the men.

Basing his conclusions on studies in hundreds of plants in America and in Europe, Mr. Calder says:

“It is absolutely necessary that foremen should bring economic education into their work of governing men. Many concerns have failed to sell company policies to their own foremen. Some of these minor bosses actually know less about industrial relations than many of their own workmen. How can such foremen reconcile labor difficulties at their inception?

This is not wholly the fault of the foremen. They are usually selected largely for their technical proficiency in their particular branch and then are forgotten by the management so far as the engineering of men is concerned. The generous treatment of foremen and the steady drawing out of their capacities for leadership and for interpreting to workmen the policies and ideals of liberal-minded owners is the open secret of some of our most happy and successful businesses.

Conferences have shown that the workman often entertains fallacies and misconceptions about industry, to which he clings tenaciously and to which many of our foremen, who are frequently the sole source of enlightenment, are not qualified to make an adequate response. Too often during periods of industrial friction foremen are mere onlookers when they might be efficient leaders and molders of thought among the small groups which they supervise.

Here are a few ideas which guide the average workman in judging his employer:

He is all for the direct, the concrete, and the personal.

He frequently believes that all his aspirations could easily be satisfied here and now out of present profits and with no more production.

He often claims that raising the sales price will settle all of his employer's difficulties, reward them both more liberally, and possibly reduce the effort demanded of them.

When the obvious objection to this in its effect on all other traders and commodities is pointed out he says, "Well, let them pass the raise on also."

Not a few workmen act on the conviction that it is a distinct advantage to employment and labor to restrict output and in doing so they are performing a moral duty to themselves and their trades. Finally, the average workman is little interested in community or national welfare. Also, the public interest, as a rule, is too remote for him to be influenced by it.

These statements may be commonplaces in the industrial world, but it should be emphasized that they are commonplaces to which several thousand foremen have no effective answer. Experience has shown that bosses ranging from twenty-five to sixty-five years of age can be sufficiently educated in a very short time by intensive processes to appreciate the industrial economics and human engineering of their job and to apply such teaching with enthusiasm to their daily routine.

Education for leadership in handling men and things has usually been concentrated on young men preparing for the higher positions, but the workman makes his contacts and has his differences with the foreman and judges his employer accordingly.

Mankind can only have what it earns. The fifty-fifty dollar that we were getting last year was due chiefly to the scarcity of goods and services. We must continue our war thrift and diligence until our debts are paid.

No juggling or jockeying by law, compromise or

force with wages or hours of labor will bring the desired ease or comfort unless it is associated with greater effort or better directed effort.

The effects of proposed conscription of wealth cannot be confined to the rich. They spread everywhere and the poor are least able to bear them. Private industry can always produce more goods at less cost than socialized industry.

The laws of economics are as rigid and immutable as the laws of physics. It would be just as easy to produce perpetual motion as to provide for a community which goes indifferently through the motions of production and then calls upon its government to divide something which it has not produced.

The workman will be contented if he obtains: Security of employment. A voice in fixing employment conditions. A fair share of the profits. Working hours yielding reasonable leisure. Prevention of profiteering. Suitable housing and welfare provision. Economic instruction. Opportunity to rise.

The contented workman will coöperate if there is: Elimination of all suspicion of his employer. Creation of confidence between him and the executives. Recognition of mutual interest in industry. Creation of machinery for facilitating acquaintance. Absence of all paternalism in industrial relations.

Let us not forget that contentment in the workman is purely relative. In democratic industry and life a healthy discontent is the normal attitude of forward-looking people. Hence it is useless in our day for employers to aim at and plan for a quiet docile organization of human units as some have done.

American and alien alike should be encouraged in

self-expression and be given sufficient education about the nature of industry to use their self-determination intelligently.

Education of Fellow-workers. The human element is the cornerstone of industry. The minds of workmen have long been undergoing a process of education that is negative and destructive in character. There are two important factors in this destructive education: First, is the natural suspicion of employer by employee, and second, the hatred of capital which has been inculcated by radicalism. These two factors create thoughts in the mind of the average employee which make it impossible for the management in many cases to obtain satisfactory results from him. On the other hand, the average worker is square, but is ignorant of the fundamental economics or basic principles on which legitimate industry is founded.

The worker of to-day is quite unlike the one of yesterday. Radical, one-sided thoughts have been breathed into his ears daily by fellow-workers who are the only ones that have interests and hopes exactly similar to his own. These associates, who live and labor on the same plane of life with him are the ones he trusts. The poison which causes his prejudiced mental attitude enters his mind by word of mouth. Often the remedy for this condition or disease, as it may be called, can be administered only in the same manner, and by the same type of person—a fellow-worker. Frequently all efforts of management to solve the problem direct by working down from the top are doomed to failure, because such efforts can get only so far. Many managers are coming to believe that the proper method to employ is to work up from the bottom. This will continue to be true so

long as employees are suspicious of their employers and the officials of their employers.

If this line of reasoning is correct, then it follows that the proper thing to do is to devote time and attention to the education of workmen through other workmen doing similar tasks in the same shops. It is possible to educate groups of men and later distribute these workers where they can be of the greatest service in overcoming ignorance and eliminating prejudice. In every plant there is a large conservative element that will respond gradually to constructive suggestion. In many plants this conservative class of workers often forms as high as 95 per cent. of the total number of employees. It is not at all unusual for 5 per cent. of the men so to coerce, intimidate, and persuade the 95 per cent. as to bring about a general strike.

A decade ago, the greater part of the thought of the students of modern industrial problems was devoted to ways and means to educate conservative managements to a more liberal and less arbitrary point of view. Of recent years much thought has been given to educating the foremen or so-called "non-coms" of industry. Although both of these policies have materially helped the situation, there are many who hold the opinion that we must undertake the development of a third policy—that of educating the workers, not through management and not through foremen, both of whom are mistrusted, but through trained co-workers in caps and overalls, who labor with the men and live and move among them.

The value of such trained workers is greatly diminished if their labors are confined merely to educative work among the men. They should be instructed

to report deficiencies on the part of the management and make every effort possible to discover causes of friction and unrest. It would be silly to assume that specially selected workmen, no matter how clever or how well trained, could successfully create a reasonable mental attitude in the minds of a body of employees if serious faults on the part of the management are permitted to continue. For this reason it is sometimes best to bring in trained workers from outside educational organizations, so that the criticisms of the management's methods may be based on a viewpoint that is unbiased and has no local limitations. While it is true that the majority of workmen to-day need educating, it is also a fact that hundreds of managements are as badly in need of enlightenment.

Trained workers of the proper kind always labor diligently and are sure to earn maximum wages. The weekly or monthly sums they receive inevitably become known to other workers, and this force of example tends to create a healthy spirit of rivalry on the part of fellow-employees, with the result that production is substantially increased. No influence is more far-reaching than that of a good example.

Industrial Upheavals. Strikes and other industrial disturbances usually have their basis in some change, usually a suppression in the standard of living. Back as far as the war between the Greeks and the Romans in 147 B.C., there was a strike of twenty thousand artisans, caused by the curtailment of food and clothing, which resulted from lessened production during the war. L. P. Alford, editor and writer on industrial topics, pointed out that here in America we are now passing through the fourth great industrial upheaval in our own

history. Each of these epochs of disturbance has been due to a period of high prices. The first was from 1825 to 1837, at which time, in proportion to population, there were as many unionized men in this country as there have been in any other period. The panic of 1837 brought a lowering of prices and swept away the movement. Another period of high prices started in 1865 and ended with the panic of 1873, while a similar movement commenced about 1887, and after record strikes of the most serious nature culminated in the panic of 1893.

Many people maintain that the recent upward price swing began in 1914, and that though the war accentuated the movement it would have come even if peace had continued. For the last six years we have been experiencing a gradual change in the standards of living, and the tendency of all of us at present is to resist those forces that seem inclined to draw us back to the levels of living that prevailed only a few years ago. As a consequence the air is filled with talk of political and economic reforms, and the industrial situation is burdened with strikes. Going back through history we find present conditions merely a duplication of what has occurred in the past.

Few people still deny that we cannot distribute wealth until we get it and we cannot get it until we produce it. It is also true that the only correct way to determine what the worker wants is for the employer or manager to use his own desires and standards as a measure. It is a mistake for the men higher up to sit apart as a choice few and attempt to pass judgment upon the desires of workmen. Every manager must climb down and consider himself as part of the unit.

The average employee does not want half of the things that are commonly talked about. He does not want merely a living wage, but adequate pay that will provide him with a small surplus to insure his future. He wants a permanent job, free from unreasonable discharge, and he desires an opportunity to better his position. Lastly, the worker wants interesting work and opportunity to carve out his own destiny.

If we must face troublesome times the seriousness of the situation that will develop may be minimized if thousands of employers will take steps while the opportunity presents to put into effect an honest industrial policy that will foster respect and create mutual confidence between every management and its men. About the only people in the United States to-day who appear to be efficient in the dissemination of information are the so-called "reds," who are busy spreading their gospel of unrest while the dignified exponents of sanity sit around and think instead of act.

One large company came to the conclusion that idle groups of men during the noon hour afforded a splendid opportunity in a plant. An investigation showed that the more the men get together and talk about their particular difficulties the bigger the troubles appear. In order to remedy this situation the concern introduced motion pictures during the noon hour, and found as a result that production increased something like ten per cent. Heretofore the work of the men had been monotonous, and this noontime diversion had given them a chance to get their minds off their work. They went back to their several tasks with a snap which they did not have before. Pictures of only one reel were shown, and in addition educational films were run to

entertain and instruct the large number of foreigners employed.

One of the country's leading statisticians recently stated that it now takes 250 people to do the same work that was performed by 100 employees in 1914. Considering that science is always advancing and coming to the support of the worker, any decrease in manual efficiency is too serious a matter to be ignored. It is a mistake to wait until the bubble bursts and assume that the situation will correct itself. Such a procedure is no more wise in our industrial body than it would be for a man to wait for the bursting of a deep-seated, infected sac in the human body, believing that the dissemination of the poison will result in a cure.

No Service without Reward. A number of large industrial concerns have adopted the policy of using competition among the individual workers and among groups as an incentive for increased production. In this scheme the best results have been obtained when the corporation gives a fair return to the group or the individual so that each competitor will know that his effort to beat the game means something real for him. In every plan of rousing interest and increasing efficiency through competition the opposing groups must not be unevenly matched, or one body of men through constantly losing would soon become discouraged.

Competition may also take place between the achievements of one group with the achievement of the same group a week or a month previous. It is possible to get competition among employees in most lines of business between groups or within groups or between individuals. In several instances beneficial results have

followed the plan of letting the individual keep his own record. This scheme is particularly effective in plants where men or women are doing hand work. Under this plan each worker knows just how he stands at any minute in the day, and he may also know at the end of the week just what to expect in his pay envelope.

One company with sixteen plants established a system of competition among its supervisory groups of employees, and found the plan especially helpful in the case of foremen. In the method employed the company determined a standard result for each department, based on the best record of cost and efficiency that this particular department had made over a period of time in the past. The foreman is pitted against this record, and when he beats it he gets a certain bonus in the form of cash or company stock, the amount of his reward depending on how far he exceeds his basic record.

Most managers have discovered that if competition and reward are confined only to the bosses you get driving instead of supervision.

Experience has shown that if the rewards are set too high the competition may become too keen, and ill feeling result.

It should be stated here that in operating a competitive system the company must arrange a graduated basic task for the new man to beat. The first month's standard should be low and then advanced step by step during the period of training, at the end of which time the worker is expected to deliver. The slogan of one concern is: "Train or explain."

One investigator reports that though shop committees, which are coming largely into vogue, are excellent bodies through which to carry on an advertis-

ing campaign among the workers to better the morale, these committees are not effective in stimulating production unless they are provided with that greatest of all arguments, a fair financial incentive to the worker for earnest, efficient service. An examination has shown that the inefficiency of a company is more often due to faulty management than to inefficient labor. Many cases are on record where managers have tried to foster competition in the matter of individual production, and by playing on the human qualities of the men have attempted to secure more valuable service without giving additional compensation to the workers. A just motto is: "No reward without service, no service without reward."

CHAPTER III

HEALTH AND INDUSTRY

Economic Value of Health—Medical Examinations—Need of Educating Workers—Health Tests—Industrial Health Plans—Health in Relation to Efficiency—Value of Proper Diet—Work and Fatigue—Eyesight and Production—Industrial Dental Dispensaries—Low Income and High Mortality—Eradicating Flies and Mosquitoes.

The Economic Value of Health. In our commercial and industrial life lies the greatest of all fields for medicine. Efficiency depends on health, and health is dependent on the care that a man gives himself, the care that industry gives him, and the enforcement of proper health laws. Illness is one of the chief factors bearing on operating costs. Many a business has failed because the man acting as the brains of a company had to lie for weeks in his home on a sick-bed.

That we have traveled a long way in recent years in the art of keeping well, let no one doubt. Not more than a decade ago in most of our great industrial plants, the wounds of injured men would become septic in fully fifty per cent. of the cases. To-day in certain of our most modern organizations, not one wound in a thousand becomes septic. One monster establishment having upward of fifty cases of cuts, wounds, and scratches each day has had only two cases of septicæmia in four years.

It is important that workmen be enlightened on the matter of fatigue. Many things make fatigue, but seldom are we fatigued by work. If a person catches a cold

or an infectious disease, it happens when he's tired. If we become chilled we get tired, for the cold makes every cell in the body work fast. In many occupations the installation of a few devices, the elimination of unnecessary movements and the introduction of rest periods will often double and quadruple the output of a worker, at the same time saving his health and strength.

The chief things that cause fatigue are dark, unventilated rooms, infectious disease, poor food, and bacteria in the mouth and tonsils. These things bring on anæmia and the individual will have a blood count of say 2,500,000 instead of 5,000,000. This means that he has only half as many red corpuscles in his blood as he should have, and, as a consequence, the blood has to circulate twice as fast through the body in order to get the necessary oxygen, carried by the red corpuscles, to the various tissues of the body where it is used to burn up the food we eat. Likewise the blood picks up and carries away the waste resulting from the combination of the food, and right here is where the shower-bath helps. It drives the blood inside and it returns to the surface much purified with the result that fatigue is lessened.

Another great cause of fatigue is irregularity in personal habits.

The problem of to-day is how to save the energy that is stored in the nation's body; how to prevent it from becoming old and exhausted before all its power has been applied to some useful purpose.

In the United States there are 36,000,000 workers who lose 323,000,000 working days per year from preventable illness. Assuming that the average wage is \$3.25 per day, the annual loss to the workers and to the nation is more than a billion dollars, without including

the loss to employers through a decrease in the potential productive capacity. Such waste is appalling and only furnishes proof that peace has her battles as well as war.

Medical Examinations. It has already been pointed out that many employers are finding great profit results from the establishment of a system of physical examination of all applicants for work before employment. When men are simply hired without being subjected to a preliminary investigation, the outcome is frequently mutually unsatisfactory. Often such men are unfit for the work in hand and after a few months they are sure to show a gradual decrease in efficiency due to the progress of disease or a dislike for the occupation they have engaged in. When a company hires men who are wholly unqualified for the service at hand the corporation is sure to lose through increased accidents, large labor turnover, or because of unrest created in the organization by these undesirable employees.

It has been found that in industries where medical examinations are unknown, the prevalence of acute contagious diseases is far greater than in those businesses where all prospective employees are carefully investigated. It is also a fact that such examinations frequently enable the placement of men in positions where their efficiency is greatest.

One investigator recently made a study of ten industries where medical examinations prevailed and showed that of approximately 120,000 applicants investigated in one year, only 66,000 proved to have no disabilities of any consequence. Nearly 12,000 applicants were wholly rejected and 41,000 were employed with a full knowledge of their disabilities. Most of these latter

workers were placed in selected positions where their infirmities would afford them the least handicap.

Another investigator makes the statement that the practice in the United States with reference to medical work in industries indicates an average annual cost of \$2.50 per employee for medical examinations. Let us assume that one of our big American industries employs 200,000 workmen. Let us further suppose that in this industry there are no medical investigations of applicants for jobs. In such an industry, 20,000 men, or ten per cent. of those employed, would be totally unfit for work and would soon be dismissed. This means 20,000 men added to the labor turnover, and if the cost of the labor turnover in the industry amounts to, say \$40 per person, then the employment of these undesirables has cost the industry \$800,000. If we accept the figure of \$2.50 for each examination as stated above, we find that this particular industry could have adopted a system of examining all prospective employees at an expense of \$500,000 annually. The yearly saving from the plan, therefore, to the industry would have been \$300,000. It is further true that additional benefits from medical examinations of this kind would have resulted to all of the individual companies making up the industry in question.

An authority on the subject of industrial hygiene called attention recently to one instance where an examination of 15,000 applicants caused the rejection in a certain industry of forty-four cases of acute contagious disease which would have caused the companies in question great loss, as had the diseased applicants been engaged it would have led to the starting of six different kinds of epidemic.

In addition to the saving that is certain to come from this plan of carefully investigating all applicants, each employer is thus enabled to fulfill his duty, which consists in safeguarding the health and happiness of all of the loyal employees who now serve him.

Need of Educating Workers. The health of the workman is his only important asset. Without it he loses the power to earn a living. Even a slight betterment in the health of a country's population increases the total working power of the whole nation, with the result that there is an accompanying increase in the level of wages.

Of course, higher wages likewise produce better health through affording the workman opportunity to improve his living conditions, but increased wages are no more a solution of the health problem than they are of the labor problem. An investigation in New York showed conclusively that more poverty is caused by sickness than there is sickness caused by poverty. Money is not the solution—the remedy lies in education. The workman should be educated to know the importance of regular meals, thorough mastication, hours of rest and sleep, ventilation of rooms, regularity of movements from the bowels, the cultivation of cheerfulness, and above all the necessity of keeping a clean nose and mouth. The time is coming when no man—capitalist or laborer—will eat a meal without first washing his teeth and hands.

No condition to-day is more amazing than the apathy with which the average individual regards the body he lives in. As an example of this peculiar attitude of mind, the case of a great insurance company that started an investigation along lines of health extension can be cited. This concern figured that if it could extend the life of each of its 600,000 policy-holders for one year

the saving in interest on death payments, added to the additional premiums that would be received, would amount to more than \$80,000,000. The company accordingly made arrangements with a life extension corporation and offered a free examination to each of its policy-holders. Out of the 600,000 insured persons only ten per cent. accepted the company's offer, which, although made purely as a business proposition, was intended for no other purpose than to lengthen the number of days on earth of the insurance company's clients.

Up until recently there has been a general disposition to classify people into three groups—the well, the sick and the dead. This idea is one of the many that were changed by the war. The military machine that was established included in its work a tremendous physical “try out” of the cream of the nation's manhood. All the figures are not yet available, but those at hand show a rejection rate for physical reasons of about thirty-three per cent. When we recall that this test was made on the most virile part of our population, the result carries added importance and reveals what a high degree of impairment exists among groups of supposedly healthy persons.

Eyes and teeth alone caused the rejection of eleven men in every hundred. Such a degenerative tendency reflects serious faults in our social system. So high a percentage of unfitness for general life is not a necessary by-product of our civilization. An analysis showed that sixty per cent. of the men rejected owed their impairments either to ignorance or neglect. Now that we can no longer assume that all persons who are busy at their work are sound and fit, the way is open for effective work along lines of prevention.

What is there in all this for the industries of America? How can the fruits of our knowledge be utilized in a practical way? A number of large companies in various industries have already discerned the trend of events. They realize that compulsory accident insurance is but a forerunner to sickness insurance. They recognize that ill-health is one of the great causes of labor turnover, and since it costs from \$25 to \$300 to break in a new man, the saving that results from having permanent workmen is an item of much importance. Then in addition to stability there is a marked increase in the working efficiency of a force when physical defects and faulty living habits have been largely corrected.

Health Tests. An example can be given of one corporation whose directors decided that purely as a business proposition the concern would defray the costs of a careful physical examination of one hundred of its principal employees. A company doing this kind of work and organized on a semi-philanthropic basis, charging ten dollars per person for examinations, was asked to undertake the work. Following is the report that was made:

EXAMINATION OF EMPLOYEES—APRIL, 1918

SUMMARY OF FINDINGS

Employees.....	100
Men.....	89
Women.....	11
Average age of men.....	36
Average age of women.....	26
Advice needed regarding physical condition or living habits (100 per cent.).....	100

Those found showing impairment or defects, either in physical condition or manner of living were classified as follows:

	Men Per cent.	Women Per cent.
<i>Slightly Impaired</i>		
Slight physical impairment or defect, requiring observation or hygienic guidance	0	0
<i>Moderately Impaired</i>		
Moderate physical impairment or defect, requiring some form of hygienic guidance or minor medical or dental attention	49	55
Moderate physical impairment or defect; medical supervision or treatment advised, in addition to hygienic guidance	43	27
<i>Advanced Impairment</i>		
Advanced physical impairment or defect, requiring systematic medical supervision or treatment	3	9
<i>Seriously Impaired</i>		
Serious physical impairment or defect, urgently demanding immediate attention	5	9

Of the fifty people (45 men and 5 women) who were referred to a physician, forty-nine of them were unaware of any bodily impairment whatever. And here are the details of the ailments of these employees.

ANALYSIS OF IMPAIRMENTS

	Men	Women
<i>Moderate to Serious</i>	Per cent.	Per cent.
Organic heart (advanced).....	0	0
Organic heart (moderate).....	17	18
Moderately to seriously thickened arteries.....	38	9
Markedly increased or diminished blood pressure.....	0	0
Moderately increased or diminished blood pressure.....	18	27
Marked urinary (albumin, sugar, casts, etc.).....	4	18
Slight urinary (albumin, sugar, casts, etc.).....	30	36
Combined urinary and other important impairments.....	12	9
Nervous.....	0	0
Lungs (positive signs).....	0	0
Lungs (doubtful signs).....	17	0
Blood infection.....	1	0
Specific infection (genito-urinary)...	1	0
<i>Minor to Moderate</i>		
Arteries slightly thickened (chiefly radials).....	48	55
Functional circulatory (rapid, slow, irregular pulse).....	24	18
Minor urinary (indican, bile, crystals, etc.).....	34	45
Digestive disturbances.....	24	9
Constipation.....	38	36
Nose, throat, respiratory.....	92	81
Ears.....	29	9
Teeth and gums.....	66	73

ANALYSIS OF IMPAIRMENTS—*Continued*

	Men	Women
<i>Minor to Moderate</i>	Per cent.	Per cent.
Anæmia.....	21	55
Skin.....	45	45
Errors in diet.....	78	55
Errors in personal hygiene.....	46	45
<i>Physical Defects</i>		
Faulty vision (not fully corrected)...	43	64
Flat foot.....	45	36
Faulty posture.....	65	55
Rupture (with truss).....	2	0
Rupture (no truss).....	1	0
Weak inguinal rings (tendency to hernia).....	2	0
Overweight.....	9	0
Underweight.....	3	9
Unclassified.....	26	9

As is customary in such a plan for health improvement, this examination was followed by further investigations at five-month intervals. Here are the results:

CHECK UP—SEPTEMBER, 1918

Number checked up.....	49
Number showing improvement (59%).....	29

<i>Items of Improvement</i>	Number	Per cent.
Blood pressure.....	7	14
Lungs.....	1	2
Pulse.....	1	2
Urinalysis.....	2	4

CHECK UP—SEPTEMBER, 1918—*Continued*

<i>Items of Improvement</i>	Number	Per cent.
Teeth.....	12	26
Eyes.....	3	6
Ears.....	2	4
Weight.....	11	22
Constipation.....	2	4
Personal hygiene.....	2	4

CHECK UP—FEBRUARY, 1919

Number checked up.....	31
Number showing improvement (61%).....	19

<i>Items of Improvement</i>	Number	Per cent.
Blood pressure.....	10	32
Teeth.....	5	16
Skin.....	1	3
Weight.....	2	6
Diet.....	1	3

The foregoing health test is typical of what will be found in any case of an average industrial group. It represents the carrying out of a plan that will eventually overcome the conservatism and ignorance of employers, and the pride and suspicion of employees. The day is near when as a matter of self-preservation industries will be obliged to take effective action to keep their workers well in order to reduce the cost to business of men absent through preventable causes, and of men on the job but operating at low efficiency because physically "below par."

Industrial Health Plans. Workmen are resentful and suspicious of plans that appear to be based on charity.

Therefore, the only safe plan for humanizing industry is to base all actions on a foundation of simple justice. One great corporation has plants throughout the country and large offices in New York. This company has asked itself: Is it right to discriminate between the stenographer or clerk here in the main office and the industrial worker at one of our plants? When any member of the New York force fell ill, the company did not think of cutting off pay for the time of enforced absence; but if the laborer got sick he received nothing for the time he was away from his task. The result of this self-examination caused a change in practice and now the corporation pays half-time wages to any factory employee who falls ill. The company's medical officer visits the man and sees to it that he secures proper medical attention, at the same time leaving it entirely to the employee to select whatever doctor he prefers. The corporation has found that its men generally went without medical attention for the sole reason that in the old days they were without earnings and felt they could not afford a doctor.

This same concern has gone ahead rapidly in its plans to meet the new industrial era that is upon us. It has inaugurated a system of physical examinations so that no man can enter its employ in a diseased condition and thus be a menace to other workmen. Also, in this way it tries to prevent being imposed upon by persons who are inefficient through physical cause and who are trying to secure benefits they are not entitled to get. When a man or woman is accepted for employment and has been with the company for one year an insurance policy is given to the individual. The amount of this insurance increases, until at the end of five years the

policy calls for one year's pay. Last year this corporation settled 146 death policies and has already paid out several million dollars in such benefits.

It is also a fact that the company referred to does not refuse to employ workmen who are not robust. In many cases it has engaged men who were cripples, but has set them tasks that they could perform satisfactorily and without discomfort. The whole idea of the company's plan is to prevent a man getting into the wrong job. Some of their employees have to work in high heat, and here the management endeavors to see that no man with a weak heart is engaged for this work. The company has a hospital for its consumptives and employees are sent there on the first indication of tuberculosis.

Another corporation—one of the greatest in America—has made an enviable reputation for itself in the matter of successfully handling its labor problems. This concern and its subsidiaries are leaders in dealing with the health question. The method employed is to work through employees' committees, some of them made up of local officials at the various plants, and others composed of workmen drawn from the rank and file of the forces at the different operations. The safety measures adopted by this company have reduced the accident rate more than fifty per cent. and have saved 23,195 persons from injury in twelve years.

In preserving the health of workmen this same corporation annually makes a bacteriological analysis of all water used for drinking purposes at each plant. It has banished the use of the common drinking cup, and as far as practicable has installed sanitary drinking fountains. The roller or common towel was pronounced a

prolific source of disease and was eliminated in favor of the individual towel. It was ordered that no more wash-basins or troughs for common use should be installed. In all new equipment the facilities for cleansing hands and face necessitate that the employee must wash from a flowing stream. In lieu of lockers for workmen's clothes there are overhead hangers, so that when the employee changes at the end of his shift his wet clothes have an opportunity to dry and air. This doing away with lockers appears to have reduced the number of cases of pneumonia, some of which were undoubtedly contracted from putting on damp clothes. Attention might be called to an added refinement in the scheme of hoisting clothes to the ceiling instead of putting them in lockers, and that is the plan of having boxes or receptacles overhead so that one person's clothing when hoisted will not come into contact with the clothing of another person. Each user, of course, locks his belongings in position.

The company operates plant restaurants and has derived many benefits therefrom. These eating places relieve the housewife of the burden of filling one or more dinner pails, and when the wife is sick or away from home the man does not have to undertake the rôle of household cook, which he has been known to do with disastrous results. The most desirable forms of food are not always adapted to packing in a dinner pail, nor will they retain their palatability after standing for several hours in unsuitable temperatures. For the unmarried men especially these restaurants are a boon. The higher prices generally prevailing in public restaurants are not an easy problem for the young workman to solve. The company sells food at cost.

Among other features tending to better health for employees is the visiting nurse whose services are offered free by the company. She is not, however, permitted to visit any home unless requested to do so by a member of the family. Her duty is to give advice in matters of household sanitation, economical purchasing of home necessities, care of children, especially in infancy, and to help in cases of sickness. She instructs the mothers in the preparation of food for the sick child, in the feeding of infants, supervises the special courses in practical housekeeping and conducts the classes in cooking, dress-making, and many other phases of domestic science, even to the proper methods of making beds.

Nearly four years ago the same corporation made its first attempt to do dental work among employees and their families. Dental surgeons were employed, and they moved with their portable outfits from place to place. Later dental clinics were established at many points. A schedule of charges averaging fifty per cent. less than the charges made by city dentists is posted in every dispensary. Then there is the time and expense saved by employees through not having to travel long distances to some nearby city to have dental work done. The dental force works in close coöperation with the medical organization and immediately takes care of all cases where bad teeth are discovered on physical examination for employment.

Health in Relation to Efficiency. Of all our business organizations few have done as much to preserve the physical and mental energy of their employees as some of the large financial institutions. The heads of these companies now ask, "Is the man physically reliable?" whereas in the past the chief question was, "Is he mor-

ally fitted for the work?" As proof of the need for a careful physical examination of all applicants for positions, one bank says that last year three cases of trachoma—a loathsome and contagious disease that is almost incurable—were discovered among the bank's applicants. It is impossible to estimate the loss that would have resulted to the concern if these diseased persons had been employed.

These company health officers do not attempt to dictate concerning the private life of any individual. If the employees stay well, the corporation does not care how they do it. Furthermore, the concern's health administration does not supplant the family doctor and gives advice on other things than pills. It may decide that the employee's illness is due to worry and will then prescribe a vacation on full pay, or perhaps advise a raise in salary. In other words, these doctors are required to know as much about psychology as they do about medicine. Only through such knowledge can the physician arrive at the initial cause of the breakdown and discover whether it is physical or mental. If it is psychic, the next move is to hand the employee a full dose of sound economics. The big boss is asked to figure out what a real live worker is worth to the company if a half-dead employee is worth so much. This line of argument usually stimulates the pay envelope.

One of these industrial doctors was called in by a large corporation to look over conditions and suggest improvements, for it was evident to the management that things were not right. The doctor's investigation brought out that the inefficiency in one whole department was due to headaches and general irritability, caused by eye strain from bad light and by poor air

from overcrowding. In another branch of the business it was discovered that the department head possessed a temperament adapted solely for a barren island. No one could get along with the boss, and as a consequence the workers were totally inefficient through their abundant worries and suspicions.

Value of Proper Diet. Hardly one in ten workmen has any ideas of what may be termed a balanced diet on which he can do his work with greatest efficiency and least effort. An investigation of the dinner pails of employees at several large mines and mills showed an astonishing situation. Not five per cent. of the men had in their buckets the proper rations on which to base a maximum physical effort.

What kind of a corporation is it that pays absolutely no attention to the character of the coal that goes into the company's boilers? And yet food bears the same relation to the body that fuel does to the locomotive. It is the basis of all human energy. Looking at the problem in this way we see the closest possible connection between diet and efficiency. The man whose habits of eating are wrong must eventually lose his speed and endurance. Three so-called "square meals" a day mean nothing, for in the matter of food it is quality not quantity that counts. It is for this reason that intelligent industrial leaders are now giving more attention to food values. Condiments that cause blistering of the skin are taken freely into the stomach with utter disregard. No corporation has any right to try to force workmen to eat things that they do not want.

Vegetables and fruits prevent constipation and eliminate headaches. Milk, meat, and the like build up the growing body and renew used-up parts. Bread and

breakfast foods are the fuel for the body and furnish the power to work just as gasoline furnishes the automobile with power to move. Sugar is also a fuel, but the average person eats more than he needs. Fats are needed by hardworking people.

Government investigators have prepared a list showing the supply of food needed per week by an average person doing moderately hard physical work. The proposed diet with quantities required is as follows: Four apples, 2 bananas, 2 oranges, or 3 peaches; $\frac{1}{2}$ pint of strawberries, $\frac{1}{2}$ pound of rhubarb, $\frac{1}{2}$ pound of dried fruit; $3\frac{1}{2}$ pounds of string beans, cabbage, greens, lettuce, onions, squash, tomatoes; 5 pounds of potatoes or sweet potatoes; $2\frac{1}{2}$ quarts of milk, $\frac{1}{4}$ pound of cheese; $3\frac{1}{2}$ pounds of eggs, fish, meat, and legumes; $3\frac{1}{2}$ pounds of bread, 1 pound of flour; $3\frac{3}{4}$ pounds of rice, macaroni, cornmeal, etc; $1\frac{1}{2}$ pounds of sugar and syrup; $1\frac{1}{4}$ pounds of butter, bacon, chocolate, and other fat; $\frac{1}{2}$ to $\frac{3}{4}$ pounds of coffee, tea, flavorings, etc. Great benefit will result from checking up on the food consumed by each person per week. In comparing the amounts used with those required, allowance should be made for the water that is present, remembering that one pound of dried fruits and vegetables is equivalent to six pounds of the same goods fresh. Milk, cream, and ice-cream count as one quarter their weight, or one half pound to the quart. One half pound of jelly or jam counts as one half pound of sugar. One pound of bread counts as three quarters of a pound of uncooked cereal.

Every management has an unusual opportunity to reduce sickness among its employees by carrying on a carefully planned campaign of education designed to foster scientific systems of dieting. Disease is caused

by a violation of nature's laws, and the only way to get rid of it is to return to those laws.

Work and Fatigue. A little fatigue is remedied by a little rest, but when the amount of fatigue is doubled we require more than twice the same amount of rest. It is this fact that renders the problem of accumulated fatigue in workers so serious. If we can materially lessen the worker's fatigue, we are attacking much of our industrial disease at its very roots, for we are eliminating the poison wastes that are generated by excessively stimulated muscles. Sugars, glycogen, fats, and even protein are burned in producing energy, and the waste products of this action when too rapidly formed pass into the blood and weaken all parts of the body, including the nervous system.

Studies in management have shown that greater output can be achieved by applying one's self steadily for short periods and then resting, than by working steadily and having no rest periods. Most people know that shower baths help eliminate the products of waste in the body and increase the capacity for muscular work. This is accomplished by the shower affecting the circulation, producing a redistribution of the blood in the body and for the time being actually changing it. A benefit somewhat akin to this in its physiological effects may be brought about by the change in blood pressure that results when the workman spends even a few minutes in a reclining position. More rest is thus provided than could be gained in a much longer time by the workman if seated upright.

The manager of one of our largest factories was the object of some ridicule when he caused the installation of some rather funny looking chairs in his plant.

At first even the employees thought it was a good joke, but they liked the manager and began to use the chairs out of friendliness towards him. It was not long, however, before all this was changed, and to-day during the rest periods all of the chairs are used, and the workmen have discovered that the plan has actually increased their productive capacity, as well as lessened the apparent labor attending their work. As an eliminator of fatigue, it will be found that the couch ranks first, then come the reclining chair, the armchair, and lastly the bench. Flat couches without even a pillow are a part of the working equipment of some of our wise men.

No form of fatigue is more serious than eye fatigue. It is just as injurious to have too much light, in the form of blinding glare, as too little illumination. When there is a glare, the employee is obliged to adjust his eyes constantly in order to see distinctly. The big problem is to get the light distributed properly. The electric bulb over the head or shoulder of the worker may be located at the right angle, while other lights at a distance and reflected light from highly polished machinery or other equipment may be very tiring. The time is coming when the finish of machinery will not be so largely affected by the problem of salesmanship. The manager will look upon a dull finish as an asset, and he will balance the matter of the workman's efficiency against the question of ornamental appearance. Beneficial results have been attained in a number of shops by giving a coat of dull paint to all nickel and other glaring parts of the plant equipment.

Recent investigations in the matter of ventilation have also brought about material changes in some of our old ideas. We know now that humidity and tempera-

ture are equally as important as the quantity of air available. These are questions that require the attention of an expert; in the meantime, too much air will not do any damage. Far-seeing managements to-day try to adjust the work to the worker rather than the reverse process. Some of them believe there is no more reason to provide the employee with working tools than there is to provide him with working clothes. If it is possible to standardize the best in a tool, why is it not possible to standardize the best in clothes? There is, of course, the prejudice of the workman to overcome, but this, as in all such matters, must be accomplished by showing the employee that the change is to his personal advantage.

As in all work that attempts to govern the actions of human beings, the final test of success is the amount of happiness that is created. Present-day industrial leaders are abandoning the term "welfare work" and are substituting in its place the phrase "betterment work." The former implies that what is done is the gift of the company to the employees; the latter tends to create the understanding that all the efforts expended are put forth by everyone for the good and profit of the organization. The workman must be taught that it is his duty to rest when he needs it, otherwise he is not playing the game fair with his employer. Above all else it must be made plain that with the increase in output there will come added compensation in the way of wages. If this is not done, the employee is justified in claiming that the fatigue-eliminating campaign is only another new scheme for exploiting the workman.

In succeeding years the modern industrial corporation will voluntarily establish medical laboratories at

their works so that the same research may be applied to men as has heretofore been applied to material things. We have passed through centuries of careless general observation of our bodies, but this will be no more, and the laboratories will stand behind the officials who are running our great industries. Demonstrated facts will be substituted for mere speculation. Corporations will no longer guess about the effects of certain dusts on employees, or hold uncertain opinions concerning objectionable fumes, or even rest in doubt as to the actual cost to the company of continuous jarring noises that upset the nerves of their workers. The chemist and the psychologist will settle such matters.

It may seem foolish at first glance, but from the standpoint of our industrial welfare there is no more sense in wearing some of the styles of shoes that are now sold than there is in savages wearing rings in their noses. Foot abuse, next to mouth infection, is the most widespread of the many unhygienic practices of civilized people. A faulty shoe means faulty posture and here we have the commencement of body impairment.

The privilege of enjoying healthful conditions is a basic human right that has not been permitted to working people to the fullest extent. No one can deny that in final analysis wages are generally controlled by output, and the worker's ability to produce is dependent on his health as represented by his brain and muscle. Let it be understood further that mental health is equally as important as physical health, and the only way we can have a nation of individuals with sound minds is through developing the worker's individuality—giving him an opportunity for self-expression.

It makes little difference to a workman whether the

head of his government is a democrat if the head of his company is an autocrat. The new watchwords are—coöperation and conciliation. A careful study of the problems relating to the health of employees will do as much as anything to substitute peace and plenty for boiling discontent.

Eyesight and Production. Investigations in various parts of the country show a definite relationship between the eyesight of workers and plant or office production. In the factories of one Massachusetts company, output was increased twenty-eight per cent. as a result of the corporation's activities in correcting the faulty eyesight of its employees. This particular concern, like hundreds of other American companies, had been giving close attention to many kinds of betterment work. The various buildings had ideal equipment and splendid ventilation. Rest rooms, work chairs, and other modern facilities designed to improve working conditions had been installed. Still there was an underproduction that could not be explained. Later the problem was solved when an eye specialist examined the eyes of the employees and found that seventy per cent. of the workers had optical deficiencies in varying degrees. The increased production mentioned above came as a result of supplying proper glasses to all those having defective vision.

The campaign for better factory and office lighting has made great advances during recent years. So have many other educational programs intended to improve conditions and increase efficiency. But, notwithstanding the fact that the chief strain of our modern industrial life falls largely on the eyes of the nation's workers, there has never been any active movement

inaugurated to improve health and enlarge production by campaigning to save the eyes.

Many companies do employ a physician who in making a general examination of incoming workers subjects them to a simple acuity test, which uncovers very few eye defects. In hundreds of lines of work where close application is required, latent optical defects rapidly develop and are entirely overlooked by both workers and management. Eyestrain is not a disease, but only a form of physical fatigue; however, it is a human defect that is now doing more to limit individual output throughout the country than many real diseases.

An examination of the records of industrial corporations that have taken over the responsibility of the eyes of their employees shows that one of the greatest results of the work has been a material reduction in the total time lost by workers who were absent because of illness or indisposition.

One big machine-tool company several years ago made a survey of all its accident cases and found that the total of all eye injuries to workers amounted to more than 6000 a year. A campaign was started to reduce these eye injuries, and splendid results were obtained. In 1917, 5016 foreign bodies were extracted from workers' eyes; in 1918 there were 1302 such cases, while in 1919 the total had been reduced to 979. Though a great majority of all these accidents were trivial in character, many of them did require that the worker should visit a physician or eye specialist, which caused a large loss of time to both the company and the men. During the last three years, since the company established its own hospital and included a dark room for eye work,

very few men with injured eyes were compelled to leave the plant to receive treatment from an eye specialist. The total saving in the time formerly lost by workers has amounted to several hundred hours.

In another large concern it was found that eleven out of fifty-five inspectors could not properly see the work they were paid to inspect. The company immediately made arrangements with a large optical firm in a nearby city to fill prescriptions for glasses and deliver same to the director of the company's health department. The optical concern allowed the corporation a material discount, which enabled the employees to purchase glasses at a low price. This eye service has always been optional, but it is in such demand that though the work at first covered but a part of three mornings it is now arranged for each morning of every working day. The company reports that this practice of giving close attention to workers' eyes has not only added to the prosperity of the corporation but has been reflected satisfactorily in the pay envelopes of the men. Consideration is now being given to whether or not the company should undertake the additional expense of grinding the lenses for the glasses and employing a resident optician.

Some of the largest corporations in the country have recently attached eye specialists to their clinics. The manager of one concern noticed that employees were using lead pencils, matches, and sticks in clumsy fashion to remove foreign bodies from eyes. As a result of this observation, emergency outfits were placed in different departments, and special workers were selected and trained in first-aid treatments for the eye. Finally a permanent relief station was installed and an optician

was engaged to devote certain hours of each day to the work. All treatment is free.

When we consider that the human eyes were built for farsighted work we must concede that the service they render to civilized people living under artificial conditions and doing fine work at close range is nothing less than remarkable. Since we are engaged in living a manufactured life it is only fair that we assist Nature in every possible way to keep up the pace. We come into this world with eyes that are farsighted, or hyperopic, as the optician would say. After we have applied ourselves to close eye work for many years there comes a change in the average person's vision, and this includes an increasing tendency toward farsightedness. When Nature thus begins to fail us the only way we can continue on close work is to have recourse to an optical correction, which we gain through the use of glasses.

Not one person in ten realizes that the eyes are the greatest users of human energy. It is for this reason that people who use their eyes for eight or ten hours continuously each day often leave their work more fatigued than other folks who engage in purely muscular labor for a like period of time. The latest theory is that one third of the nervous energy of the body is allowed to the eyes. When there is a defect in one's vision or the person's eyes are overworked, a demand is made on the entire nervous system for more energy to balance the fault. The body can give up this energy only at the expense of other vital organs, and this is the reason why uncorrected optical defects cause trouble in the stomach and other distant parts. No worker can maintain normal efficiency when his energy is being sapped by eyestrain. When people appear to be suffer-

ing from some unknown disorder the wise physician of to-day will look to their eyes as well as to their teeth when searching for the source of trouble.

In our industrial system the greatest part of the losses due to eyestrain comes from workers who have only slight defects in their vision. When a man has eyes that are very defective he immediately consults a specialist and is provided with glasses. The chief trouble is with people who are suffering from such slight defects that the evil consequences of their troubles are ignored.

The United States is now experiencing a loss amounting to millions of dollars annually, due to the mistakes, spoilage, slow work, and inefficiency of hundreds of thousands of workers who are suffering from slight optical defects. If eyestrain is permitted to continue in our lives until those suffering from the trouble actually experience pain, then the evil has reached the point where the penalty is severe and the cure expensive. One industrial manager who investigated this problem stated that he found men in his employ who were as greatly handicapped by defective sight as they would have been if minus an arm. When we take into consideration that many cases are on record where individual efficiency has been increased thirty or forty per cent. through correcting defective vision it will not appear that any attention or expense devoted to solving this problem by industrial concerns is a philanthropic expenditure. On the other hand it is the wisest kind of investment.

The prevalence of eye trouble is best illustrated by a case that recently came to light. One company, with more than four hundred employees, conducted an

examination that showed 324, or 78 per cent., were subject to eyestrain. It was found that headaches and eye fatigue were more common among those employees engaged in the closer types of eye work, and it was also discovered that there were more defectives among the unskilled laborers.

When employees understand that the company will not discharge them or in any way practice discrimination because of defective vision, they will be only too glad to coöperate heartily with the management in carrying out an effective plan of eye inspection and correction. The returns from such a policy are definite; they are the kind that show up in the worker's pay and the company's net.

Industrial Dental Dispensaries. As teeth are common to us all and as the success of a nation's business depends largely upon the health and attendance of its workers, few things have a closer bearing on the country's production than sound teeth. When we permit the children of our country to grow into maturity with broken and infected dental structures, we give the nation each year an army of new workers who are no more able to attain a capacity for maximum production, than if they were started on their careers minus an arm, or with a vital sense missing.

As has already been indicated, the industrial dental dispensary is rapidly becoming an important part of all progressive corporations that are large enough to support such an establishment. Our efficiency engineers have come to recognize the value of dentistry as an economizer of time. One large company in Ohio states that its dental department saved the concern a total of 21,031 hours in a six-months' period. The plan fol-

lowed at this plant was to call each employee for a dental examination at stated intervals of time. Before the company established its dental work, all employees suffering from their teeth were obliged to go six miles to the nearest city in order to get attention. The same thing was true here that occurs in most plants of this kind—men suffering from toothache take off a day or at least a half day when they are obliged to go to an outside dentist for relief. If they can secure attention on the premises, the lost time will be reduced to a matter of minutes.

In many of the industrial dental dispensaries, the doctors are employed only to make examinations and do prophylactic work. In such cases the patients are recommended to their regular family dentist for treatment. At a number of plants, however, the company dentists do all kinds of dental work, including artificial dentures and bridge work. An examination by one investigator at a number of such plants indicates that the annual cost to a company doing such work for its employees will average about \$4.00 per person. There are certain instances where the members of a local trades union have organized and support a dental service of their own. In the majority of cases, however, the industrial dental dispensaries are supported partly by the company and partly by the welfare or mutual aid association of the corporation. Relief from pain is rendered free, but other services are charged for and the worker is allowed to pay for them on the installment plan. In the case of a labor union in New York City the dental dispensary costs the members \$100 a month for housing the clinic, and \$50 a week for the services of a dentist. During the first year, this clinic treated

1398 patients and notwithstanding the nominal charge that was made, showed a deficit of \$3291. If the cost of the equipment to furnish the dental office is excluded, the clinic succeeded in paying for itself.

One large corporation charges a nominal rate for time spent in the dental chair. In all needy cases the company stands the entire expense. Free dentistry is supplied by the company to all children of employees. One of the big department stores in an eastern city has established a dental dispensary and makes no charge for cleaning the teeth of its workers. In the matter of real dental work, however, the concern has arranged a nominal rate of charges based on a sliding scale corresponding to the salary of the employee. Payments on the total charge are made monthly. One of our large insurance companies established a dental clinic and allowed employees the privilege of visiting the dental office for free examination. The results of the plan were so conclusive in the matter of time saved, etc., that the plan was changed and a ruling was made requiring the attendance of every employee at the dental clinic at least twice each year. The average cost to the company for maintaining this department during a recent year amounted to \$2.33 per person.

In combating the serious problem of dental disease among employees, various organizations have issued carefully prepared instructions for the home treatment of the mouth. One of the leading oral hygienists has given the following rules covering the care of the teeth: Brush the teeth with clear water upon rising in the morning, and after each meal with a dentifrice. Follow the brushing after meals with the use of floss silk in all inter-tooth spaces. Complete each cleansing

by rinsing the mouth thoroughly with lime water. In brushing the teeth use a light, rapid stroke, maintaining a circular motion and touching not only all the surfaces of the teeth but also the gums and the roof of the mouth. It is difficult to get the average individual to spend sufficient time in brushing his teeth, for this reason it is best to handle the matter by setting a fixed task to perform. Experience indicates that each person, in cleaning his teeth, should make thirty-two complete circles in each area in the mouth. Investigations have shown that great benefit will result from also carefully cleansing the tongue with a strip of celluloid or whalebone before the teeth are washed with a brush. The individual should not use pressure with the brush and should never brush the teeth or gums crosswise. The lime water that is advocated for flushing the mouth after the cleansing of the teeth has been completed not only washes away the food débris, but acts to dissolve a glue-like deposit known as mucin from off the teeth. This mucin is the material that protects the germs that are active in food fermentation. The lime water should be forced back and forth between the teeth with the tongue and cheeks until it foams, which action indicates that it has been in the mouth long enough to have a beneficial action on the teeth. The mouth should then be rinsed with clear water. If the lime water seems to be a little strong at first, it may be diluted; however, this solution should be used full strength just as soon as the gums have become hard and healthy under the rapid, light brushing. No less than fourteen minutes should be expended in the daily care of the teeth.

Low Income and High Mortality. In relation to the health, happiness, and welfare of workers, too much

emphasis cannot be placed on the fact that the efficiency of a married employee depends in large measure on his peace of mind. It follows as a matter of course that if he has children at home who are ailing and in need of medical attention which he is unable to afford, then the abstraction that comes with brooding results in not only cutting down his own personal efficiency, but oftentimes constitutes a menace to his fellow-workers if their safety depends in any way upon his unswerving attention. This phase of health conservation leads up to the question of low wages and its relation to sickness and infant mortality.

A recent survey covering many large cities and including data concerning the fathers of 23,780 babies, disclosed that in practically all of the cities studied the lowest income groups were the highest infant mortality groups. The investigators found that the child death rate declined as housing conditions improved. In homes where the rental paid was less than \$7.50 per month, the infant death rate was 211.4 per thousand; in homes where the rental was between \$7.50 and \$12.49, the rate was 172.1; where the rent was from \$12.50 to \$17.49, the rate was 156.7; in homes where the rent was \$17.50 or more, the rate was 100, while in homes that were owned by the parents, the mortality rate was only 86 per thousand.

In one Pennsylvania town the infant mortality rate was 72.6 in homes where there were bathtubs, while it was 164.8 in houses that were without bathing facilities. In a Connecticut town the death rate for children born in houses located on the street was 120.6, while that for children born in houses located on the rear of lots or on alleys was 172. Overcrowding is another condition

that results from low income. In one New England manufacturing city the deaths of infants showed a steady increase according to the number of persons per room. It was 123 where the average was less than one; 177 where the average was one but under two; and 261 where the average was two but less than three.

Another investigation deals with the mortality of infants of wage-earning mothers. Low-wage fathers and wage-earning mothers are in practically the same groups. In one city it was found that the death rate among babies of mothers who were employed was 312, while the rate was only 122 among the babies of women who did not work for a wage. In this connection it must be understood that the figures covering women employed takes into account only those who worked outside their own homes, and where as a consequence there was necessity for artificial feeding due to the mother's absence.

Although poverty is almost always accompanied by a certain amount of ignorance, there is but little evidence that in knowledge of maternal matters, the poor average far below the mothers in other classes of society. The real trouble lies in the unfavorable environment that surrounds the needy. The remedies that suggest themselves are proper medical and nursing care for all mothers; adequate teaching; and the arousing of a sense of community responsibility for decent housing and sanitation; however, the final and fundamental remedy lies in a general recognition that a decent income, self-respectingly earned by the father, is the strongest safeguard against a high infant mortality rate.

Eradicating Flies and Mosquitoes. Sufficient has been said in the preceding pages to drive home the

truth that health conservation that begins and ends in the office, factory, or plant is not health conservation carried out to its logical conclusion. That company is most successful and most humane which in addition to showing interest in its employees while engaged in actual production tasks, also interests itself actively in their home and community life. The confidence of the workers having once been gained, any plan for industrial or social betterment, no matter how radical it may seem, will be met more than half-way.

Of all the efforts put forth by one large company none designed to foster health have been more uniformly successful than the campaign to eliminate mosquitoes and flies. In one large southern district where the corporation operates many plants the normal total for malaria cases was 6000 annually. According to the safety and welfare manager of the company, doing away with the mosquito has reduced the cases of malaria to less than 50 per year. This remarkable result was accomplished through properly draining streets and alleys, and where practicable pools and lowlands were drained and filled in; if this could not be done, they were covered with crude petroleum.

Over 200,000 circulars explaining the dangers from the fly were distributed among the employees last summer. Metal garbage cans equipped with tight-fitting covers were placed at the rear of each house at all outlying camps and at convenient places throughout the mills. Garbage and other waste materials are collected periodically and burned. There is also careful inspection of stables and prompt disposal of all stable manure for fly prevention. These measures have brought about an enormous reduction in flies, with the result that

typhoid cases are now down to almost nothing. The sanitation committee in charge of all of this work has undertaken various other studies that will likely furnish new and illuminating information on health topics for American industries.

Notwithstanding all that is being done to conserve health, the great field for this work is yet virgin soil. No company should approach the problem in a spirit of philanthropy. It is strictly a matter of good business looking toward increased operating efficiency. The amount of time lost by employees through illness is far greater than that lost as the result of industrial accidents. Every corporation has an investment of from \$2000 to \$2500 dollars in each man employed. That being the case, why not take as many precautions to safeguard these investments in humanity as are taken to safeguard financial investments?

CHAPTER IV

LIGHT AND VENTILATION

Primary Considerations—Industrial Lighting—Mistakes in Lighting—Hazards of Poor Illumination—Benefits of Proper Lighting—Light in Relation to Production—Practical Lighting Suggestions—Ideal Light Conditions—Use of Searchlights in Industry—Comfort and Humidity—Importance of Moisture in Air—Efficiency and Temperature.

Primary Considerations. Outside of food, water, and air, light, heat, and ventilation are perhaps the most important boons of mankind. For hundreds of years the human race has been wrestling with the problem of producing artificial light to banish the hours of darkness Nature throws upon us, and artificial heat to take the place of the sun's warming rays. Not one person in ten realizes that the sciences represented by light, heat, and ventilation are among the rare arts of the present day, and that industrial efficiency, health, and happiness depend in great measure on our skill in the production and proper utilization of these artificial aids to life.

Seeing undoubtedly outranks all the other senses as regards its part in the avoidance of accidents. Every industrial manager would undoubtedly appreciate the fact that a blind man is in danger if put to operating a lathe, press, or other moving machine commonly used in a factory. However, this same manager often overlooks the fact that a workman partially deprived of the sense of sight, due to insufficient light, is proportion-

ately subject to accident. We may prevent many accidents by using mechanical safeguards, but it is also possible to reduce their number by improving conditions and making it easier for the individual to know instantly when danger threatens. It is quite astonishing, but true, that the number of fatalities resulting from slipping, tripping, and falling exceeds the combined total of fatalities due to automobiles, street cars, and fires. We seldom trip over objects we can see, so it is true that the best insurance against tripping and falling is good illumination. Lighting for production and lighting for safety are closely related subjects. It is all very well to say that a man who has lost a finger on a buzz-saw was careless, but who can say that the chief carelessness was not on the part of the management which failed to appreciate the value of good lighting?

Illumination engineers to-day are not far from the realization of their greatest aim, which is to make the interiors of buildings "as bright as day." Every lighting survey conducted to date has shown that actual lighting conditions in our homes and industries are subnormal to a startling degree, compared with standards promulgated by accepted authorities. The progress in lighting is being helped materially by the growing belief on the part of industrial leaders that the problem is largely one of economics. Investigations have shown how insignificant is the cost of good illumination in comparison with the value of a workman's time. It has been proved that in many factories the employees need save only forty or fifty seconds each hour to offset entirely the cost of better lighting. One further consideration that is deserving of close attention in these days of under-production is the saving in over-

head expense which may be effected by using a factory building and its equipment for more hours per day through the provision of adequate artificial lighting.

Mechanical ventilation is a wonderful science, and, as a matter of necessity, it will be one of the most widely practiced engineering arts in the years to come. The danger to artificial ventilation is the same as that which threatens all new industries, and comes from the extremists, both pro and con. A few who favor it, particularly certain enthusiastic manufacturers, have been foolish enough to urge the great desirability of mechanical ventilation in places and under circumstances where such a method is wholly unnecessary and is a menace instead of a benefit.

The mere act of providing an adequate air supply is only a small part of the ventilating problem. The real job is to get proper distribution of the air; to maintain correct wet-bulb temperatures, and eliminate dust, bacteria, and odors.

The number of people that can safely be enclosed in a building depends not so much on floor area as on an adequate volume of fresh air. If we are going to depend on window ventilation, we must either stop production of many materials or double the number of our factories. We can't do the latter, so let us not be too quick to condemn mechanical ventilation, lest we are throwing aside one of the important remedies for our trouble. The fact is that in its proper application, mechanical ventilation has long passed the experimental stage, and has proved to be a positive boon to that part of the human race who live in populous communities.

Industrial Lightning. It has already been established that there is a definite relationship between good light-

ing and the health, happiness, and individual production of industrial workers. Before any physical effort can be performed in an office or factory, the human eye must see one or more objects clearly, and this requires a certain amount of time. Under good lighting, the time required is less, production speeds up, and an increased output results without added exertion on the part of the workman. Of several hundred manufacturers who were asked what in their opinion were the chief benefits of good lighting, 79 per cent. named increase in production; 71 per cent. decrease in spoilage; 60 per cent. prevention of accidents; 51 per cent. improvement in discipline; and 41 per cent. improvement of hygienic conditions.

A large number of manufacturing concerns are now operating to full capacity on a day shift only. The only possible way such a concern can increase its output is to provide additional machinery and working space or to operate at night. In the past, night work was looked upon with disfavor largely because the belief prevailed that men could not produce sufficiently under artificial light. There may have been good cause for such a belief in days gone by, but recent advances in the art of illumination make it possible for us to light a plant at night in a manner to compare favorably with daylight in intensity, diffusion, softness, and even color.

An examination into this matter by one of our best-known lighting engineers brought out the fact that an illumination of from 5 to 10 foot-candles in a factory would require an expenditure of a little more than 1 watt per square foot of floor space, assuming that well diffused lighting units were to be employed. With

current at 2 cents per kilowatt-hour, the total cost of lighting should not exceed 7.5 cents per square foot per year for a night shift of 2500 hours. On the other hand, if this same company were to double the size of its factory and operate on a day shift only, it would have to compare with the 7.5 per square foot annual cost of lighting, the annual rental value of the addition to the plant fully equipped with machinery and ready to operate. The yearly charge to cover interest, depreciation and taxes on such a plant and its equipment will amount to from 30 to 75 cents per square foot per year. For example, the charge for a plant of 100,000 square feet area would fall between \$30,000 and \$75,000, depending upon the location and the kind of industry. The cost of lighting this plant for night work would not exceed \$7500, so it is plain that there would be a saving of from \$22,500 to \$67,500 to the company through operating a night shift. Viewed in the light of the fact that rent now comprises from 15 to 30 per cent. of the increase in the prices of raw materials that pass through manufacturing establishments, it is evident that night operation would surely result in a substantial reduction in the cost of manufactured articles to consumers.

In this matter of night work there is the common objection that men do not like such work and that night labor is opposed to the natural order of things and is conducive to ill-health. It is undoubtedly true that work on a shift commencing at midnight would likely work injury to the individual in the course of time; however, many factories could be operated with a morning and evening shift, the latter ending at midnight. In such case, the workers on the second shift would not have their night hours of rest greatly dis-

turbed, and it would not be long until many forms of amusement, catering to the leisure time of workers, would be adapted to the changed conditions.

In order that one may correctly consider the question of industrial lighting, it is essential that certain fundamental facts should be fully understood. The unit of light intensity is the candle-power. A lamp is said to give a light intensity of ten candle-power in the direction of some given object, when it gives ten times as much light to this object as would be given by a candle, if the latter were substituted for the lamp under consideration. The unit commonly used for measuring illumination is known as the foot-candle, and this is the illumination on a surface one foot from a light, which gives one candle-power in the direction of the surface. There is also another unit, known as a "lumen," which is used as a measure to determine the value of a source of light. One foot-candle corresponds to one lumen per square foot of lighted surface.

Most people believe that an interior space can be too well lighted and that injury will result therefrom. The truth is that harm seldom or never comes from too much light. In practically all cases, glare, not light, is the damaging factor. In order to make this point plain, let me call attention to the fact that the light intensity outdoors at noon in the month of June will average about 9600 foot-candles, while the average light intensity at night-time in most of our offices and factories will seldom exceed 5 or 6 foot-candles. In other words, the human eye is perfectly comfortable outdoors with a light intensity more than a thousand times as great as is generally used by people in the evening when they read or work at home or in an office. At the same point

where the noon intensity in June is 9600 foot-candles, the average light intensity at noon in December will only be about 4300 foot-candles. When the atmosphere is hazy the light intensity will be decreased 15 or 20 per cent. If the lower atmosphere is filled with smoke, the decrease in daylight intensity will usually amount to at least 25 per cent. The intensity of daylight illumination with an overcast sky may vary all the way from 1 per cent. to 50 per cent. of what it is when the sky is cloudless. What is known as civil twilight continues from the time the sun sets until it is 6 degrees below the horizon. At a latitude of 50 degrees at the time of the summer solstice it lasts 51 minutes, as compared with 26 minutes at the equator. During this twilight interval, the light intensity diminishes from about 100 foot-candles to less than 1 foot-candle, after which artificial lighting is necessary.

One investigation by a factory executive showed that at 5 A.M. on a June day outside his plant the daylight intensity was 250 foot-candles; at 7 A.M., it was 995; at 9 A.M., it was 2700; at 12 M., it was 4050. This same investigator found that on a December day at 5 A.M., the exterior daylight intensity was 0 foot-candles; that is, there was no daylight; at 7 A.M., it was still dark; at 9 A.M., the light intensity amounted to only 250 foot-candles; at 12 M., it was 750. It is plain, therefore, that at this particular location there was less daylight intensity at noon in December than there was at 7 A.M. on a June day. This shows plainly why artificial light is often required all day long in many offices and factories during the darker winter months.

Mistakes in Lighting. Most people fail to realize that it is just about as bad to half lose both eyes as to

lose one eye outright. Authorities tell us that in the majority of cases the need of glasses is caused by the kind of light we use to work under. There is no better light tester than the human eye, and when we get a signal in the form of a pain it is safe to assume that the artificial light surrounding us is deficient in quality or volume. In many plants the illumination is so arranged that strong light is directed to the cutting point of tools and to the tops of work benches, while all around the operative a semi-darkness prevails. Such illumination blinds the workman because of the sudden transitions of vision and causes him much physical discomfort. Excessive light on spots causes eye strain and poor vision of surrounding areas with resultant accident.

As to the cost of proper lighting, it is easy to figure out just how much time a workman will have to lose to equal the cost of all the light he could possibly use all day. Such an investigation will bring out the surprising fact that a loss of about three minutes on the part of an individual worker will more than cover any additional cost that a company would be likely to spend for perfect illumination.

Daylight even when more intense than artificial illumination is the easiest of all light on the eyes. The reason for this is that daylight reaches us in a high state of diffusion. One of the common mistakes we make in industrial lighting in the case of over-strained eyes, is to reduce the intensity of the light instead of increasing the diffusion. Many managements, in taking up the question of lighting, attempt to secure results wherein all shadows are wholly eliminated. This plan is not conducive to distinct vision, for it is the shadow that

produces the "relief" in objects, making them "stand out." Therefore, to see distinctly objects other than flat surfaces, shadow is necessary. It must not, however, be so intense as to hide the line of demarcation between the object and the shadow, or so sharp in outline as to appear to be part of the object.

Hundreds of big industrial plants in the United States use arc lamps, which, as everyone knows, give a light that flickers. With such illumination, the pupil of the eye is constantly opening and closing, endeavoring to accommodate itself to different intensities of light. This condition causes fatigue, which not only depreciates the "ability to work," but also the "willingness to work."

Hazards of Poor Illumination. Here in the United States each year, 25,000 persons are killed or permanently disabled, 500,000 are seriously injured, and more than 1,000,000 are slightly injured. Expressed in dollars alone, this loss is tremendous. It is one of the basic troubles underlying labor unrest. Anything that can be done to reduce or eliminate this condition is worthy of careful consideration. Deficient industrial lighting is an important cause of accidents. A majority of our lighting installations in factories, shops, and mills are improper and inadequate. This is due primarily to praiseworthy, but ill-advised, attempts to better the plant illumination on the basis solely of providing a greater candle-power output. The questions of distribution, diffusion, and absence of glare are either unknown or not appreciated.

How many thousands of accidents occur in storage places and dimly-lighted shops no one knows. When illumination is poor, raw materials and finished products

are often piled in uneven tiers which fall over at inopportune moments. Tools and finished parts are stored on shelves and are placed so near the edge they fall on unsuspecting workmen.

In some supposedly well-lighted works, many employees are injured, not as a result of insufficient illumination, but because of poor light distribution. A certain work bench was well illuminated by local lights with proper reflectors, but the bench cast a shadow, and the general illumination was not sufficient to offset the shadow. There followed a sequence of small accidents due to the toppling over of partly finished work piled in the shadow. When a lighting arrangement was installed that eliminated the shadows, the accidents stopped.

In a chemical plant was a passageway that was not often traversed, and which, as a consequence, was not lighted. A carpenter was called in to do some general work. In the passageway a cup had been placed to catch the drip from a slight nitric acid leak until repairs could be effected. The carpenter, assuming that the cup was placed to catch oil drip, poured some of the acid on his saw and then rubbed it with his hand. Before neutralizing agents could be applied, the man's hand was badly burned. If there had been proper illumination, the workman would have noted that neither the color nor the consistency of the acid corresponded to that of an oil.

Many workers labor along painfully, not realizing that their unusual fatigue comes from glare or light reflection. An investigator noticed a workman at a stamping press continually stood at one side of his machine. The man explained that he could not see in

any other position. The inspector discovered that there was plenty of light, but the man was working on large tinned sheets and when in front of his machine, a dazzling reflection was directed toward his eyes. Although the shop foreman was going to solve the problem by getting a larger tungsten lamp, the trouble was easily removed by simply adjusting the local light so as to change the angle of incident and reflected rays.

Here is a simple statement that would save hundreds of thousands of dollars annually if it were known and observed by every man in America who runs a shop or bosses men: "*The loss of illumination due to the coating of reflectors with dirt may result in a loss of light equal to 60 per cent. or more, before attention is given to the fact that they need cleaning.*" It is often possible to reduce the current consumption in a plant 25 or 50 per cent. through the systematic cleaning of all reflectors and lighting equipment. By adopting this simple plan of cleanliness it is often possible not only to eliminate the need for an additional installation of lamps, but it is frequently the case that a company may thus reduce the necessity for using all of those already installed. In some works, managers have contended that the cost of systematic cleaning is greater than the benefits derived, but such an argument is too false to deserve serious attention. Lamps that are properly placed can always be reached. If this is impossible, it is easy to replace fixed lamps in high places, with others that may be quickly lowered.

Ever so many instances are on record showing the direct relation between poor illumination and accidents. One great industrial association made a study of the subject, and found that the percentage of accidents in a

long list of plants was only a little more than one half as great during the hours when all the work was done by natural light as during an hour when artificial light was used to supplement natural light. A similar frequency was also noted between the winter days with fewer hours of sunlight and the longer summer days. Another survey proved the greater frequency of accidents in plants where the walls were dark and rough, and in similar plants where the walls and ceilings were kept smooth, clean, and of light color. In this connection, just remember how much easier you got around on a night when the ground was covered with snow. Everything was so plain and the visibility was twice as good as on other nights when the ground was bare and the landscape bleak.

Benefits of Proper Lighting. One engineering authority states that his experience in manufacturing plants shows that the installation of scientific systems of illumination will produce the following benefits: There will be 10 per cent. more output; 25 per cent. less spoilage; 26 per cent. fewer accidents; and 25 per cent. better workmanship. There will also be more light per unit of current consumed, less sickness, decreased labor turnover, and if desired, twenty-four hours utilization of facilities.

In support of these statements it is interesting to read the report of a large insurance company. In this report the writer says that, "A survey of 91,000 accidents from the company's records for the year 1910, show that 23.8 were due to improper illumination." The author explains that there are now fewer accidents due to the progress in illumination, but states that, "There is foundation for the assumption that 18 per cent. of our

industrial accidents to-day are due to defects in the lighting installation. On that basis the services of 108,000 men for one year are lost annually because of insufficient light."

As to the question, what constitutes good lighting? The best answer may be found in Nature. "Light without stint" is not the answer. Often the sun's rays are too intense, and here we have an example of "light without stint." Experts now concede that the ideal illumination occurs on a cloudy day when light from the sun must pass through a screen of vapor and clouds before reaching us. So it would seem that Nature, herself, is at her best when supplying a semi-direct form of lighting.

But this is not all. It has been further discovered that not only must the illumination be uniform in diffusion and intensity on adjacent walls as well as on working areas, but the light must be of the proper color to suit the purpose for which it is employed. All classes of work do not require the same intensity of lighting. Again, red and yellow light rays have greater penetrating power than blue rays. Consequently, in such places as foundries, where there is a heavy cloudy atmosphere, the red or yellow rays serve best. As for the much talked-of glare, this is something difficult to define. An automobile headlight at night may be dazzling and hurtful to the eyes. The same light may be operating just as fiercely at noontime, but when viewed against a background of daylight, may be hard to recognize. Likewise there are conditions in shops where glare is present in sufficient degree to work injury to a workman's eyes, and still the man's mind may not be acutely conscious of any such dazzling light. Some-

one aptly said that, "Just as dirt is matter out of place, glare is light out of place."

Light in Relation to Production. In an iron pulley shop where lighting tests were conducted to discover the value of good lighting in definite terms, the consumption of electricity amounted to 0.27 watt per square foot. The daylight effect, except on one or two machines, was negligible. The windows were few and dirty. A lighting committee took hold. The electrical consumption was increased almost seven times, and the average illumination approximately 25 times. The new installation consisted of 200-watt, reflector-equipped units mounted 10 feet above the floor. The testing engineer's own records showed an average increase in production of 20 per cent. The proprietor's figures indicated an increase of 35 per cent. in output.

An interesting case was that in a Western machine shop. Here an elaborate lighting test was to be made. A new lighting equipment was put in for one month and a record secured. Then a second and better system of illumination was installed and records of production for a second month were obtained. The testing engineers had planned that during the third month the plant was to revert to the original system of lighting. When this was broached to the management of the operating company, the officers flatly refused to go back to the old scheme of illumination, stating that the increase in their production as made possible by the improved lighting was vastly more important than the testing engineer's desire to secure entirely unbiased data. The higher efficiency and production was determined by a study of eight operations. The increase

ranged from 8 to 27 per cent., the average being 15 per cent. This test was significant because the original illumination, coming from 100-watt lamps, was held to be at least 20 per cent. superior to that of industrial lighting generally.

Another test was made in a shop handling heavy steel parts used in trucks. The improved lighting resulted in a production increase of from 6 to 14 per cent. in three operations. The cost of productive intensity was $1\frac{1}{2}$ per cent. of the pay-roll. In a carburetor-assembling shop, the men had to handle small parts and make delicate adjustments. The management, appreciating the value of good light, had installed an equipment well above the average. However, a new scheme of illumination was put in, and although the test was made just after the signing of the armistice when company efforts were slackening, the productive intensity of the shop was increased 12 per cent. Because the number of workmen was large and the rate of wage high, the increased production was secured at a cost of only 0.9 per cent. addition to the pay-roll.

We are told that application throughout American industry of our best present knowledge in the lighting field would result in a 15 per cent. increase in industrial production. By using our pencils, we find that this increase is equivalent to the production of an army of approximately 1,500,000 workers, who consume neither food, clothing, or wealth in any form; an army that produces without additional factories or machinery; an army that gives at least two thirds of its wages to be divided between capital and labor.

If the statement is true—and excellent authorities say it is—that here in the United States we lose

\$150,000,000 each year through industrial spoilage—nearly \$30,000,000 of which is due to poor lighting—then there is a real need for better illumination in our many factories and mills. In addition, if we are injuring 108,000 workmen annually because of deficient light, then surely there is cause for urgent remedial measures.

Practical Lighting Suggestions. A few points worth remembering may be stated as follows: Painting the walls and ceilings some light color will generally reduce glare, especially that resulting from contrast. Usually glare resulting from reflection from a polished surface can be overcome by decreasing the brightness of the light source at all angles below the horizontal. Glare permitted to continue may permanently injure the eyesight. Light that comes from a number of small units is better diffused than light that comes from a single source. In the latter case the shadows are sharper and darker.

Industrial buildings should be planned and located with proper reference to the points of the compass. Rooms depending upon side-window lighting should be designed to keep down the maximum distance of any worker from the window to not more than twice the height of the tops of the windows above the floor. Roof lights of the saw-tooth design are frequently advisable. It is best to locate the wall windows near to the ceiling, especially in low or deep rooms. They should occupy as much of the wall space above the working plane as possible. Translucent glass is often advisable for the upper portions of windows and for skylights. Direct sunlight should be avoided, because of the glare and contrasts produced. Awnings or shades will often prove advantageous. Opaque shades should generally

be arranged to pull upward, as this will cut off the excess light from the workers near the windows. Workbenches should run at right angles to the window surfaces. Nothing is more important than the proper and regular cleaning of all windows.

In designing a system of lighting, it is usually desirable that the lamps be arranged so that they can be turned on and off separately or in groups. If the lamps are in rows, these should be parallel to the walls having windows, and each row of lights should be controlled separately. The light intensity in a room may often be increased materially by simply refinishing the ceiling and walls. In plants where there is no careful system of inspection and cleaning, the light intensity will often decrease to one half of normal. In large plants a lighting department, with regular inspectors, washers and repair men, should be maintained. The company should provide special facilities for cleaning, and also extra lamps and reflectors to replace those taken out for cleaning.

The results of recent tests show plainly the remarkable betterments in lighting that can be obtained by thoroughly washing what appeared to be fairly clean lamps and reflectors. In one instance, the silvered glass reflectors which were in use in an office building were selected for test. Before any cleaning was done, the light output was measured. Then the lamps and reflectors were thoroughly wiped out with a dry cloth and another measurement was taken. Next the lamps were thoroughly washed with soap and water and a final measurement recorded. The results indicated that the illumination in the office was increased fifteen per cent. by wiping, and twenty-two per cent. by washing. In

other words, the job of cleaning was only two thirds done when the units were merely wiped with a dry cloth. Lighting units should be cleaned at least once a month, and the cleaning should be a real one and not a mere wiping out.

Good lighting should no longer be considered as simply a necessary and unavoidable item of expense, but rather should be looked upon as a desirable investment likely to produce a handsome profit. Contrary to the trend of practically all other manufacturing costs over a period of several years, the cost of light has been almost continually decreasing; while the average cost of life's chief commodities has more than doubled since 1909, the cost of light is about one fifth of what it was at that time. This means that if expressed in terms of other manufacturing costs, the price of light to-day to the consumer in most parts of the United States is less than one tenth of what it was a decade ago. It is one of the few things that a fellow can be pretty safe in saying that the more of it we use the cheaper will be its cost, for the bigger the plant that produces light, the lower will be the operating charges. The field for better lighting is virgin, and the new era for the industry is just commencing. It is one of the several important remedies for our industrial ills, and we make a sad mistake in failing to quickly and fully appreciate the possibilities of the science of lighting.

Ideal Light Conditions. The final step in lighting will be the production of lamps that will emit rays of light of the proper color for certain classes of work. Daylight, as most people know, is made up of seven colors. The relative luminosity of the four principal colors is as follows: Red, 12; yellow, 280; green, 1000; and

violet, 16. This means that to see as clearly with the light composed of red rays as with one of green, we need eighty-three times as much energy transformed into light. The best example of the efficiency of the green ray is the little firefly whose light is confined wholly to this one color.

This matter of color in light is of greater importance than most managers recognize. None of our present lamps are a perfect substitute for daylight in those businesses where the workers are required to match colors. Even under the strong yellowish-red light of a modern tungsten lamp, practically all blues appear black. One famous system of factory illumination gives off light of a bluish-green color and is much used in plants where there is abundant machinery and other objects that might produce glare under lamps giving light containing all the rays of the spectrum.

In many drafting rooms, the workers are compelled to work with daylight on one side and artificial light on the other to dispel shadows. In such cases, it is essential that a light be adopted that will blend with daylight and, as everyone has discovered, not all lights will do this. Equal care is necessary in selecting the proper illumination for machine shops where the workmen consult blue prints frequently and set gages many times daily. In one big automobile factory, the examining room where all the new motors are tested usually contains an atmosphere filled with considerable smoke and vapor. The workmen who made the examinations found it difficult to see clearly in the performance of their duties. Illumination experts were called in, and a special light was installed that would penetrate the thick atmosphere. After this improvement had been

made, it was found that many more motors were tested, and there was less work for the adjusters later.

Of all the industries that have made a careful study of lighting, the motion picture business ranks first. Success in the "movies" depends on good photography and the latter is largely dependent on proper lighting. The motion-picture camera makes sixteen exposures per second, and with such a speed, both the quality and the quantity of illumination must be the best possible. In this work, the light must be of short wave length and high actinic quality to reduce the silver on the film satisfactorily, and produce pictures with the proper light-and-shade modeling. The ideal light for motion pictures was found to be one rich in green, blue, and violet rays, and with this knowledge in mind, the indoor work of the "movie" studios has advanced by leaps and bounds. The motion-picture managers found that "light is cheaper than labor" and that overhead charges can be reduced materially by making pictures at night as well as during the day. The big salaries of the stars, like the tides of the ocean, never cease.

The question of lighting is a subject that should be carefully investigated by every company official who has not already done so. In many industries, the art of illumination has never been considered a matter of moment. However, it is one of the probable ways that may furnish a remedy to offset that last ten per cent. increase in wages that is making present net earnings look sick when compared with the reports of last year.

Use of Searchlights in Industry. Though artificial light is a necessary adjunct in dye manufacture, cotton grading, color printing, paper manufacture, dentistry,

and many other industries where close matching is necessary, the greatest recent advance in the art of illumination is in the development of the modern searchlight. Perhaps the most interesting use to which the searchlight is being put at present is in the effective illumination of airplane landing fields for the Post Office Department's fliers at night, as well as for other commercial airmen. The use of high intensity searchlights for penetrating fog and as a guiding beacon for airplanes lost above the clouds is being given considerable attention. Engineers are confident that as a result of their war-time experiences, they can develop a searchlight powerful enough to penetrate thick fog, a feat which at present writing has not been wholly successful.

Many plans are under way for a standard method of landing-field illumination in which the searchlight is to be a necessary part. When this is accomplished, night flying will be made as safe as in the daytime. In addition, small searchlights are being produced for installation on the planes themselves.

Among the new peace-time commercial developments of the searchlight is the tower searchlight—a device mounted over an enclosed structure and operated from a point within, the direction being indicated by telephonic communication from patrols outside of different places. In this light, the beam follows the movement of a handle in the hands of the operator. This is valuable in protecting large manufacturing plants, railroad yards, etc., where a powerful light, rather than a number of smaller projectors, is more desirable.

Floodlighting is but another name for "searchlighting" on a smaller scale. The lessons of the war have taught a wider use of floodlighting for commercial

and industrial purposes, especially during the period of strikes and riots through which we now are passing. Industrial plants and workmen must be protected through the night from those who, under the cover of darkness, seek to destroy. The surrounding fences, the approaching roads, and the dark places in the yards must be illuminated to increase the visual distance of the policing force. Well-lighted yards also prevent accidents and tend to increase the speed of transportation.

Contractors are now being called upon to do a large amount of construction work at night, which requires a low-priced and durable floodlighting unit. Floodlighting projectors with their convenient mounting and capability of illuminating large areas are particularly well adapted for this class of work. Many thousands of these projectors are now being used extensively where night work is being carried on.

Comfort and Humidity. Thousands of factories and offices do not need an artificial ventilating system because they contain rooms where the space per occupant is ample; the window area is adequate; there are no excessive noises outside, and the surrounding air is sufficiently clean to breathe. Then there are other buildings where the opposite conditions exist. Windows occur only on one side of the rooms; partitions divide the space into small areas where air circulation is impossible; disturbing noises surround the building, and the outside air is contaminated by the fumes. In this latter case, window ventilation becomes impossible and mechanical means must be adopted.

Air conditions are controlled by the following factors: Dust, bacteria, carbon dioxide, odors, air motion, and

last and most important, temperature and humidity. Mechanical ventilation becomes desirable when the space per occupant is less than eight hundred cubic feet and when the window area is less than twelve per cent. of the floor area. To judge air by using a dry-bulb thermometer is wrong, for the dry-bulb temperature does not determine comfort. Furthermore, it is ridiculous to assume that a fan and heater connected with a system of ducts, provides a proper ventilating equipment. Such an installation is simply a crude arrangement for blowing heated air into a closed room.

Importance of Moisture in Air. The average person has not yet grasped the vital importance of humidity in the air we breathe. For every degree of temperature and velocity of air motion, there is a proper degree of relative humidity. If the air contains too little humidity (moisture), then the rate of heat loss from the body by evaporation becomes too rapid and a sensation of chilliness is produced. When there is an excess of humidity, there is retarded evaporation which produces a feeling of nervous irritation and enervation. Authorities differ slightly in their opinions as to the proper atmospheric conditions for offices and factories, but the popular belief favors a temperature of about 68 degrees, with a relative humidity of 52 per cent. One experienced observer advocates the maintenance of a wet-bulb temperature of not less than 57 degrees. In this connection it should be remembered that as the temperature advances above 68 degrees, the humidity should be decreased, and vice versa. In other words, the heat balance should be kept stable.

One State Commission on ventilation found that in the winter months, by reducing the temperature in a

factory from 78 degrees to 68 degrees, the capacity of the employees for work was increased 35 per cent. In effecting this large temperature reduction, the investigators increased the humidity in proper proportion and the workers were no less comfortable. During the war when we had to conserve coal, it was brought home to us forcibly that we would feel warmer at a temperature of 64 or 68 degrees with a 50 per cent. humidity, than we would at a much higher temperature with a very low humidity.

Let us see what happens when we attempt to heat air to the point of comfort in the winter months. If the outside atmosphere is zero and the humidity 50 per cent., the air contains one quarter grain of moisture per cubic foot, and would have to be heated to a temperature of from 80 to 90 degrees to be made comfortable. After being heated to such a temperature, the air would have left a humidity of only two per cent., which condition of great dryness would be responsible for the high temperature necessary to comfort. The average winter temperature in our Eastern States is about 35 degrees, and the humidity about 60 per cent. To make this air comfortable it must be heated to 80 degrees, for in warming it up the humidity is decreased to about 22 per cent. These examples indicate plainly how necessary it is to add moisture to heated indoor air in the winter-time if we would avoid the high temperatures that are necessary to comfort, but are at the same time so enervating.

Our eminent physicians agree that a lack of humidity in our living and working rooms is the one important thing that makes the air in these rooms weakening and unhealthful. One series of tests in the schools of a

large city showed that during January and February the percentages of humidity in the class rooms varied from 8 to 20 per cent., which result is quite interesting in view of the fact that the humidity of the Desert of Sahara is 30 per cent. The series of ills that accompany such air conditions are too numerous to mention. These rooms had mechanical ventilation without humidification. Natural open-window ventilation could not have been worse and would likely have been better.

Efficiency and Temperature. A New York committee investigating ventilation found that "the total work of the muscles of cats is reduced about 25 per cent. by an atmospheric temperature of 91 degrees and a relative humidity of 90 per cent., as compared with an ideal temperature of 69 degrees and a humidity of 52 per cent." Similar results will be found on an investigation of human beings working in an office or factory. A famous engineer says that there is a seasonal variation in the physical efficiency of workmen. Maximum efficiency occurs in the spring and autumn, while the lowest efficiency comes in mid-winter and mid-summer. Temperature is the main factor in these variations. The optimum, or most favorable, temperature for human efficiency is 60 degrees. A slightly varying temperature is more stimulating to workmen than one that is uniform; a small decrease in temperature, say five degrees, has more beneficial effect than a small rise. Efficiency is greatest at the end of a storm, and less so on a very clear day. The ideal climate from an industrial standpoint is one where the temperature range varies from 38 to 68 degrees, and in which the humidity is uniformly neither high nor low. It is best if there are moderate daily changes in temperature.

Another fact worth noting is the effect of dry air on the mucous membranes of the nose and throat. The drier the air, the more moisture that will be absorbed by this air as we breathe it. The organs of the nose and throat can supply only so much moisture. Beyond this amount they become overworked. Lack of humidity is the chief factor in producing nasal and post-nasal catarrh. Dust is a menace, but it is less a cause of nose and throat affections than dry air. Dozens of careful tests are on record, and they support the foregoing conclusions.

As to the quality of the present-day air in a large city, one examination showed that this air contains 100,000 to 1,500,000 dust particles per cubic foot of air; 100 counts of bacteria per cubic foot, and a material percentage of gases. Tests indicate that a proper air washer will remove from 50 to 98 per cent. of the floating dust. It is not unusual to remove from four to six pails of mud from a single air washer each week. In the matter of gases, the washer will eliminate most of the soluble gases. In Philadelphia, one of the grammar schools is located near a large garage. Gases from this garage found their way into the fresh-air intake. A report of the health officer stated that, "a sample of the water taken from the air washer was two thirds dirt and carbon, about twenty per cent. oil, and a large percentage of gasoline." The gasoline was found to burn freely when a match was applied. Surely here was a case where mechanical ventilation was desirable, and it is not an isolated instance.

An air washing and humidifying plant for an industrial concern working a thousand men, will cost from \$3000 to \$5000. Taking actual figures from recent

practice, we find that the operating costs of such a plant amount to from 25 to 50 cents per person per year, and in this cost is included interest and depreciation on the investment. A considerable deduction is made for the saving in coal resulting from the lower temperatures rendered possible by the humidification of the air. The first cost of such an equipment usually amounts to only one or two per cent. of the total cost of the building.

CHAPTER V

LABOR-SAVING MACHINERY

Multiplying Man-Power—Cheaper Machine Production—The Machine Tool—Man a Wasteful Machine—Material Handling—Mechanical Freight Handling—Mechanical Aids in Automobile Building—Material Handling in Paper Mills—Savings Effected by Machinery.

Multiplying Man-Power. Perhaps the most interesting moment in all history was when the first man stood up on his hind legs and commenced to defend himself with a weapon. With this early dawn of consciousness came the idea that a human being might accomplish more through the control and use of a machine or some mechanical device, than by depending solely upon the power of his own hands.

Not so long ago each man, besides being a warrior, farmer, dairyman, and hunter, was his own doctor and the principal teacher in the family school. Likewise he was a manufacturer of useful implements, explorer, and transportation manager. But this era soon passed and this multiplicity of functions were delegated to a number of individuals and organizations. To-day we have reached the age of extreme specialization and to-morrow will be a new epoch when the lowliest man will be master of a machine of one kind or another which will perform the arduous labor of industry that has heretofore fallen to the lot of the human individual.

Of all possible ways to better our present industrial and economic situation, the one that deserves most

attention just now is the substitution of mechanical means for human effort. Wherever a machine is installed to take the place of human labor, workers are released for other essential tasks that require hand and head attention.

But the greatest opportunity and the most urgent need just now is for the installation of labor-saving machines in the production, handling, and distribution of both raw materials and finished goods. The chief aim of American industry is to multiply man-power. This end can be accomplished most speedily through substituting mechanical devices for human hands. Machines not only free mankind from drudgery, but they reduce costs through increasing output and decreasing the total of physical action. A certain amount of human labor is beneficial to the individual, but an excess of physical effort is harmful since it dwarfs both mentality and development.

The history of the advance of civilization is really only a recital of the invention of one labor-saving device after another. When the first wheelbarrow was finished and primitive man was able to dump the load from his back and convey it in this simple but efficient device, the human race received a decided impulse forward. But now, after centuries of splendid service, the wheelbarrow is obliged to give way to the mechanical truck, just as the galley that was rowed by hand eventually succumbed to the superior merits of the power-driven ship. All such inventions increase man's capacity for work from two to ten times what it formerly was.

If we removed from the earth all of the power-driven machines that are now operating, it would be impossible to crowd on to this globe sufficient people to produce an

equal amount of the commodities that are now being made with the aid of labor-saving devices. For instance, just imagine how many people would be required to produce the present yearly output of wire nails if the work of making this useful product were to revert back to the method employed when the old wrought-iron nail was made by hand.

Labor consists of two factors—energy and intelligence. Each day machinery will be more largely utilized to replace the power or energy element, so that if we would keep pace with our mechanical development the intelligence factor contributed by the human being must be more and more highly developed in the individual. No matter what view we may take of the future, it is impossible for us to avoid the conclusion that industry can only escape the strangle hold which labor appears to more and more impose upon certain processes by the substitution of automatic control for the skill of the worker. And this development will be a blessing to the men supplanted, for in such a case workmen will be free for use in places where they are now badly needed. This will increase the production of wealth per capita, benefiting everybody thereby. Every improvement in machinery makes the labor of man more productive, and production means prosperity, not for one but for all.

Cheaper Machine Production. A lot of folks with millions invested in all kinds of producing plants literally have been mentally floored of late by the tidal wave of demands for thirty- or forty-hour weeks, fifty per cent. wage increases, less bodily effort, and ideal living conditions. "These extravagant requests are absurd," says one. "What are we coming to?" asks another.

Out of the babble of voices we are commencing to hear the faint murmur of a few wise individuals who possess not only clear brains, but definite, practical convictions. They are familiar with every detail of the history of industrial progress. They have not forgotten the cry of labor twenty years ago, when workmen insisted that more machines would deprive them of their bread and butter. They have noted what did happen following this outcry, and know that the substitution of mechanical means for doing things has not only reduced the physical effort of labor, but has actually created vastly more jobs and higher wages.

These men have seen the evolution of plants where most of the work was formerly done by hand. They have watched the introduction of machines into the business and have seen outputs tripled. They have seen a company that sold a thousand articles at a thousand dollars apiece, rapidly develop the production to ten thousand better articles which were disposed of at five hundred dollars each. They have observed that where such plants formerly employed three hundred men, they now employ six hundred to operate the machines that now produce ten times the original quantity of goods. In other words, experience has shown that mechanical substitutes reduce costs so materially that markets are often enlarged many-fold. This means more jobs instead of fewer places for the men who labor either with their hands or their heads.

Always it has happened that when humanity has lost its grip and appeared to be floundering in despair, invention has bobbed up and pointed the way to shore. We may kneel and implore the politicians to give us salvation in the form of laws; we may hire able econo-

mists to refine and perfect our national monetary system; and we may burn the midnight oil in our efforts to smooth and improve industrial relations, but the problem of high wages, increased production, reduced hours, and labor shortage, will still remain for the inventor and the engineer to solve with machines, which in coming years will do everything but think.

A few instances where necessity was a stimulus to invention may be cited to prove the truth of the statement that on our engineers and inventors depends in large measure the solution of the labor problem.

Up in Michigan, a progressive contractor was erecting some buildings for a large manufacturing concern. The call for the completion of the job was most urgent. In the midst of the rush, and at a critical moment in the construction work, ten men performing an essential service in the chain of building operations went on strike.

At first glance it appeared that the whole job would have to be shut down tight. The superintendent in charge, however, refused to concede defeat and set about finding a way out of his trouble. All possible inventive ability was brought to bear on the situation, and in a few days a couple of machines had been rigged up to do the vital work previously performed by the ten strikers. As the days passed, the machines were improved and the cost of operating them, which at first was high, was soon reduced to a figure that totaled less than the cost prevailing before the strike was declared. Two men with the aid of the machines were able to do the work that formerly required ten men. The strikers were forgotten and the building operations went for-

ward to completion. A certain class of labor had been dispensed with for all time.

Only recently more than one hundred periodicals in New York City were compelled to cease publication because of an unauthorized printers' strike. At first no effort was made to resume operations, but after several weeks had passed and no solution of the trouble appeared imminent, some of the publishers in their emergency decided to resort to other methods than those that had been commonly employed.

Instead of compositors, typewriting machines were used. The first editions of certain periodicals using this method showed a ragged edge on the right side of each column similar to those which appear on the right side of a typewritten letter. The second week, a simple way was found to "justify" the lines and give columns with straight edges. One publisher in his third trial found it possible to even do away with photo-engraving and substitute for this method a lithographic process. This reduced costs and gave a better-looking page.

The important thought in the matter is: We never know what is possible until we are confronted by an emergency. The war was an emergency of the first order, and such arts as aviation and shipbuilding were developed in a few years to a degree of perfection that would have consumed a decade or more under normal demands. We are now facing a new kind of perplexing situation: a conflict that presents no less danger to the nation than the fight we recently finished. Many industries are threatened with a stoppage unless new methods can be devised for doing things. Soon it will be impossible to concede further demands to most classes of workmen for the limit of forbearance on the

part of the public has about been reached. The necessity of the hour is plain. The remedy now rests in the hands of the inventor and engineer, just as it did in the urgent days of war.

At the present moment, most of our trouble is with the more common types of labor, and it is this class of workers that has been generally ignored by engineers in their application of machinery to industry. Such jobs as digging trenches, loading materials, and pushing indoor trucks by hand are now being eliminated by the use of labor-saving devices. When we consider for a minute that in the United States there are more than one hundred thousand stations, or transfer points, where bulky goods are handled by hand, the opportunity that exists for a single type of machinery is quite clear. One authority states that in over ninety per cent. of our factories and mills the management could easily save the time of from one to ten men by an installation of modern labor-saving inventions and equipment. This same expert adds that the cost of the installation would be saved in one or two years.

The Machine Tool. Few men are better informed in machinery matters than John H. Van Deventer. Asked to give a brief survey of the situation in respect to mechanical substitutes, and especially with regard to that primary essential, the machine tool, which is so vital in the production of other machines that are required in our everyday industrial practice, he said:

“Every productive machine, whether it be one that makes our clothes, cuts pigs into sausages, or threshes the grain from wheat, is in part or wholly a product of the machine tool. So when one considers the probability of more efficient

mechanical handling of the world's work to make up for the loss of war, it is of interest to see whether or not these fundamental machine tools which create other machines are setting a good example.

"Those who are in a position to take a bird's-eye view of the machine tool-building industry see some very wonderful and encouraging things going on. There was never a time in the history of the art of tool making when as far-reaching improvements or as many improvements have been made as are being made to-day.

"Here is an illustration of an improvement in machine tools and its effect upon industry in general. Everyone knows that the Diesel engine is a remarkably efficient power plant. German submarines were driven across the ocean by means of these engines. They are expensive to build, however, and this has somewhat limited their use in America. The crankshaft of a typical Diesel engine weighs some 15,000 pounds, and has required thirty days of cutting in various machine-shop tools to finish it. Within the past few months a new type of crankshaft lathe has been produced, a giant, thirty feet long, which finishes these cranks in two days. Think what it will mean in the extension of the use of Diesel engines when similar economies in time of making are applied to the other parts.

"How are these results obtained? By providing enormous power at the cutting tool and *building operating brains into the machine*. The modern machine tool designer does not stop where his predecessors left off and provide a tool that other brains must operate. He builds operating brains into his machine, makes them automatic or semi-automatic. In other words, the machines do the measuring to the thousandth of an inch, handle and transfer the work into different positions for different cuts, and perform complete cycles of their own accord instead of waiting for an operator to will them to do this or that.

"The milling machine is typical of this modern develop-

ment of the machine tool. Wonderful devices of this kind are busily at work machining tractor motor cylinders for the Fordson tractor. All that the attendants have to do is to put the cylinders in unfinished and take them out in their final completed form, the machine does the rest and works to the thousandth part of an inch at the rate of two hundred of these heavy motor castings every eight hours.

"Machines of this sort applied to take the place of lathes and also of drilling machines are coming into use in our most progressive shops. Of course, there must be an immense production to make their use possible. But great daily output handled on machines of this sort is what is going to increase the purchasing power of our dollars. It is going to change our conception of the term 'labor-saving' into its true meaning, 'labor-investing,' for the machine tools of the near future with their wonderful efficiency will open up a myriad of new possibilities in many other industries.

"Where you find wheels, you find civilization and progress. Where you don't find them you find the cannibals eating the missionaries. Necessity may be the mother of invention, but a high wage rate is the daddy of the labor-saving device. Why can prices of commodities come down while wages of those that make them go up? Simply because machinery puts its weight on the low-price side of the seesaw and overbalances the weight of the wage load. Labor-saving machinery is the only thing in the world that can bring down prices without knocking the bottom out of wages."

Man a Wasteful Machine. One engineer who has perhaps given as much attention as anyone to the problem of substituting mechanical power for manual methods is D. B. Rushmore. His conclusions are both original and interesting. He says:

"The average man of 154 pounds, without clothing, expends approximately 65 calories of energy while sleeping.

When he is standing at rest the same man expends 100 calories; typewriting rapidly, 140 calories; carpentry, 240 calories; stone-working, 400 calories; sawing wood, 480 calories; running, 500 calories, and severe exercise of almost any nature about 600 calories.

"This hourly expenditure of energy by the average-size man, although it is but approximate, has a distinct and interesting bearing on whether and how this energy can be replaced by a machine, in order that the man may be turned to other labor. This point is emphasized over and over again when one sees many men doing what a few machines could do. It is evident that if a man expends, say 250 calories of energy doing something which could be more efficiently accomplished by a machine, his employer saves 250 calories of human energy by substituting the mechanical device for the human workman, and this permits the man to be used in a way that is more profitable both to himself and to his employer.

"This is certainly the age of power. In 1890, the total horse-power produced by electric motors in the manufacturing industries of the United States amounted to 15,569. Nine years later, this aggregate horse-power had been increased to 492,936. Five years later, the total had reached the astonishing figure of 1,592,475 horse-power, and in another five years the total had become 4,817,140. To-day, without definite figures available, a conservative estimate would place the horse-power produced by electric motors at about 9,000,000. If nothing else were needed this surely is an indication of the ever-growing importance of the increased production resulting from the substitution of machines for men.

"For example, let us take a specific instance—the steel industry. During a period of ten years, the primary horse-power used increased from 1,649, 299 to 2,706,553, while the electric horse-power increased from 254,258 to 1,207,715. On the other hand, the number of wage-earners in the in-

dustry increased from 207,562 to only 248,716. During the same interval, the production of steel in tons increased from 13,670,592 to 32,403,957. Analyzing these figures we find that the primary horse-power increased 64 per cent. and the electric horse-power 475 per cent. The wage-earners increased 20 per cent. and steel production increased 71 per cent., that is to say, the increase in the number of wage-earners of 20 per cent. brought about an increase in steel production of 71 per cent., which larger production resulted principally from the great increase in the use of electric motors. Without doubt similar conditions exist in most other industries."

Material Handling. In no other respect has the invention of labor-saving machinery better justified itself from the standpoints of economy and time than as aids in the handling and distribution of raw and finished materials in bulk.

In handling cotton bales at certain points in the South, the load-carrying electric truck will carry ten bales per load with more speed than one man can carry one bale. The use of these trucks for handling cotton has released hundreds of men for more important work requiring individual service. Trucks of this same type were first used in New York City for handling baggage at the railroad stations, but their use has now been extended from freight and express handling into many other industries. At one of the big rubber factories in Ohio, their first electric truck was installed six years ago and is still operating, after having run 180,000 miles. This particular machine hauls a load of 3,100 pounds each trip and makes one trip around the department every four minutes. In an average eight-hour shift it pulls over 200,000 pounds of tires and cores, doing work

which formerly required the time and energy of 25 men. The power used is storage battery, and it is only necessary to make a change every eight hours. The tires on the truck have averaged 40,000 miles each.

In a number of cases, where regular train service has been established in manufacturing plants, these electric trucks or tractors pull loaded trailers in groups of six to ten. The trailers and trucks are so designed that each tracks perfectly with the truck ahead, which makes it possible to turn short corners and traverse narrow aisles. In planning new plants in the future, manufacturers will undoubtedly provide better floor surfaces than exist in many plants to-day, and this, in turn, will materially increase the present efficiency of these electric trucks.

Down in Baltimore, a large brass and copper company was having difficulty securing men to handle brass and copper in their warehouse stock-room. The loads averaged about 700 pounds and the stock was all moved by hand. The manager made a survey of the situation, and then installed an overhead trolley conveyor system costing \$700. Reports indicate that the conveyor has paid for itself in direct saving in less than six months, and in addition to releasing two men for other important work, the installation has eliminated the annoyance to the management of having frequently to secure extra men for days or weeks when much material was moved and the work was unusually heavy.

One of the big beet-sugar companies in California was faced with the difficult problem of securing numbers of men for a brief period of service, as the sugar season is comparatively short, and during this time everything must move at a feverish rate. The company operates

two shifts of 12 hours each, and when the sugar is sacked it must be stacked immediately to make room for the next run. For many years the bags of sugar had been trucked by hand across an immense warehouse. Later it was piled by hand, 14 men being required for each shift, or 28 in all.

In solving this problem, the company purchased two hundred feet of sectional electric conveyor and an electric portable piling machine. As the warehouse is filled, the sections not needed are removed and laid aside. Power is secured from motors placed overhead, each power unit driving a number of sections, and as the system shortens the power units are also removed, stopping all waste of power instantly. The system is unusually flexible, and when the stacking is done, the units of the conveyor may be shifted about to carry sugar, beet-pulp, or beet seed directly into railroad cars, to motor trucks, or any other point desired. The conveyor has not only eliminated much of the back-breaking labor formerly done in this plant, but it has largely insured the company against the evils of a labor shortage and has greatly reduced the breakage due to human carelessness. Furthermore, the installation has released 20 men for more important work, which, at \$5 per day, in a 100-day handling season, amounts to a total saving of \$10,000 in the company's pay-roll. Instead of 14 men on each shift, the present arrangement necessitates the use of but four, and these four exert only half the physical effort that was formerly required of them.

At one of the large ports in Oregon, a system is in use whereby bags of flour, boxes of salmon, and other articles are loaded into ocean-going ships by portable conveyors used in connection with gravity chutes. The

chief engineer in charge of this installation reports that he has been able to load 75 tons of flour per hatch per hour with this system with less physical effort on the part of the men than was required by the old-style shift-gear method which still prevails at all of the Atlantic ports and where it is seldom that a speed greater than 25 tons per hatch per hour is secured. What is still more important, there is little breakage or wastage with the conveyor system, while with the New York burtoning method in which rope slings are used, there is a considerable loss due to the damage to bags striking the hatch sides.

Another important factor of material handling by machinery which appeals to both management and men, particularly the latter, is the use of these devices to eliminate the dirty jobs as well as the drudgery. For example, it is doubtful if the fertilizer industry at the present time would be able to survive the labor conditions of the present day without the use of machinery. The work is not only heavy and continuous, but the general conditions of handling bulk stuff from which the fertilizer is made are unsanitary, noisome, and otherwise objectionable. The resulting difficulty of getting efficient men for this work has brought about the general use of all types of handling equipment in the fertilizer industry. Among the machines used are locomotive cranes and trolley hoists with grab buckets; tractors with trailers employing automatic dump cars; overhead traveling cranes with grab buckets; portable bucket conveyors, belt conveyors, and piling and sacking machines; also automatic dumping hoppers and various types of elevators.

Down in Virginia one fertilizer company states that

it is now piling bags to a height of 20 feet, whereas in the old method with hand-piling the bags could only be piled to one third that height. The company states further that the cost by machine piling and stacking is only 50 per cent. of the former cost, the saving being about 14 cents per ton.

An unusual case of economy in the use of mechanical handling methods is that of an installation of a conveyor system at a town in Louisiana. At this point there are thousands of bags of cotton-seed meal to be carried from river barges up a steep bank into a storage warehouse. Formerly these bags were carried on the heads of negro laborers, a slow, back-breaking, expensive job. To-day, in place of a steady line of men toiling up the hill, a set of sectional portable conveyors takes the bags directly from the deck of the barge into the warehouse at the top of the bank, and the work the men have to do is merely to carry the bags from some point on the boat to the end of the conveyor.

Great savings are now being effected by many concerns through using portable loading and unloading machines of the bucket type, which will easily handle no less than 1 cubic yard of material per minute. The economy of such a system is evidenced by the experience of one large Eastern company that handled 17,000 cubic yards of gravel and broken stone. Auto trucks were used, and these carried 5 cubic yards per load. The bucket loaders were able to fill each truck in five minutes, and the saving over hand methods amounted to 15 cents per cubic yard. In addition to this economy, there was a saving of about 20 minutes of truck time per trip, and four men were released for other work. It is also important to note that the use of the

loading machine eliminated the necessity for purchasing another truck, while the mechanical loader only cost one quarter as much as the price of a truck.

A recent large installation of handling and conveying machines at Baltimore has enabled one of the railroads entering the city to transfer more than 500 men from the dirty, hard labor of shoveling coal to much cleaner and more important work. The machine coal-handling system in question enables 125 men to deliver as many tons of coal per hour into the holds of vessels as could formerly be delivered by the combined hand-labor of 635 men. During the war, the mammoth ship, the *Leviathan*, was coaled repeatedly in 24 hours. Such a task in Japan and many other countries where the thousands of tons of coal are placed in baskets and then passed from one worker to another, would consume upward of a week's time. Greater than the loss occasioned in so handling the coal is that suffered by the steamship company through the idleness of the vessel for so many days.

If someone fifty years ago had been able to predict actually what is being accomplished in material handling by the big derricks and locomotive cranes of the present day, few people would have been willing to credit the forecast. In one of the big flour-milling plants in Minneapolis, three men with the aid of a huge derrick are able to handle all the coal necessary to feed nine monster boilers ranging from 250 horse-power to 600 horse-power each. This derrick is equipped with a 112-foot boom and a 67-foot mast. Besides handling 575 tons of coal in eight hours, it spots dozens of railroad cars daily, and handles pieces of new machinery weighing as much as 8 tons.

At a small town near Pittsburg, a railroad company maintains a 40-acre storage yard which usually contains about 100,000 tons of scrap. A large part of this scrap is shifted in and out of the yard from day to day, and all of the handling of the heavy pieces is accomplished through the use of a locomotive crane equipped with lifting magnets. Manually, this work could not be done at all; mechanically, it requires but the labor of a few men, a 10 to 20-ton locomotive crane and electrically actuated magnets. These magnets are only 42 inches in diameter, but will lift and hold pieces of iron and steel weighing 5 tons. The cranes will average one pass every 30 seconds, and will load a 50-ton car in 30 minutes. They also do all the car switching in the yard, and can travel at a speed of 8 miles an hour. While handling scrap occupies a large part of the time of these cranes, they are also employed for handling coal, limestone, gravel, and similar bulk material. It is only the work of a few minutes to take off the magnet and hang a $1\frac{1}{2}$ cubic yard clam-shell bucket in its place.

Of all recent inventions designed to reduce the manual labor of handling material, none are more important than the tier-lift trucks of various types now being put on the market. The slowing-down in building during the last three or four years has brought about a congestion in storage space, and this trouble is being partly overcome through the use of these trucks, which are not only able to carry goods from one point to another, but will stack the goods to a considerable height. In the plant of one light and heat corporation, one type of tier-lift truck is used, and the company is now able to pile materials three tiers high instead of one tier, as formerly the practice. The new system increases the

storage capacity of the plant from 288,000 pounds of material to 864,000 pounds. In such cases, of course, it is always necessary first to investigate and determine whether or not the floor will stand the added weight. If it will bear the increase, the company is fortunate, for it is much cheaper to purchase two or three of these tier-lift trucks than it is to provide additional space by enlarging the factory.

Down in New Orleans, at one of the big warehouses, the former plan of handling the big tobacco hogsheads was to do the tiering by hand, at the same time using skids and man-power with ropes. This method required eight men in a gang and footed up a handling cost of 32 cents per ton. One power truck, with a tier-lift attachment was installed, and now only three men are required and the handling cost has been reduced to 9 cents per ton. Another example of like economy is the experience of one motor-car company in Detroit. Balance-wheels weighing approximately 700 pounds each were stored in single tiers, as it was practically impossible to lift them higher than the one tier. Now, with the aid of a tier-lift truck, the company is able to store these 700-pound units three tiers high, saving about 4500 square feet of floor space, increasing the storage capacity 200 per cent. and effecting an approximate saving of \$2000 per year in labor costs.

A recent invention of a labor-conserving machine which will handle coal for retail delivery, and will ultimately materially aid in reducing the cost per ton to the consumer, is a practical device that automatically loads coal into bags. With the use of this machine, two men can easily load from 20 to 35 tons of coal per hour into bags for retail delivery. Each machine is provided

with screens which thoroughly clean the dust and dirt out of the coal before it is placed in the bags. One installation of this kind in a Connecticut town has trebled the tonnage per day which two men can handle. An accomplishment of this kind is quite important in view of the fact that the larger part of the cost of coal to the consumer is made up of charges to cover the handling of the material.

A unique application of mechanical handling equipment is an installation in the offices of a street-railway company in one of the largest cities in Ohio. The company in question now handles more than a million nickels per day, as well as hundreds of thousands of tickets and other coins. The receipts from the street-car conductors are brought into the railway company's offices in tall steel containers, 24 inches in height and 10 inches in diameter, each provided with two handles and an automatic, self-locking cover. The first process in handling these collections necessitates lifting the containers, which weigh several hundred pounds each, to a height of 6 to 8 feet, so that the contents may be dumped into the hopper of an automatic machine which separates the tickets from the miscellaneous coins. This is practically a continuous operation all day long, and has heretofore required unusual physical exertion on the part of two men. The railroad company recently installed an overhead electric trolley hoist which not only lifts the containers, but opens them and dumps the contents into the hopper of the machine, the entire operation requiring only one man. After the automatic machine sorts the tickets from the coins, the latter drop into a steel bushel basket, which is lifted by an electric hoist, and its contents dumped into a coin-sorting ma-

chine. This last-mentioned machine separates the pennies, nickels, dimes, and quarters—each denomination automatically dropping into other steel baskets. Finally the coins are handled by several small machines which count each denomination and wrap the coins into properly marked packages for delivery to the bank. Whereas a large clerical force was formerly required for this work, the present system is almost entirely automatic, and human labor is practically dispensed with.

This same street-railway company, like most of its kind, has been seriously handicapped for money in recent years, and has been obliged to put forth every effort to speed up service and reduce costs. An investigation showed the management that the number of cars in operation had increased only 25 per cent., while the population of the city had increased 40 per cent., and the number of rides sold by the company had increased approximately 70 per cent., over a period of less than 10 years. One apparent remedy for the situation was to try to eliminate every cause that tended to interfere with a high schedule speed of the cars. As a consequence, the company's engineers were asked to prepare a plan for using traveling motor-truck cranes to keep the tracks clear of as many work trains as possible. Work trains necessarily held up passenger cars when switching from track to track, and this always broke the schedules and demoralized the service. The plan now employed is to use automobile truck trains running on the highways or streets alongside the track instead of the old-fashioned work trains. The truck train requires only three men instead of a gang, to place trolley poles in holes, to load and unload sand, gravel, cement

bags, etc., and to handle rail ties and poles from trailers to the right-of-way.

All of the foregoing instances are presented, not just to show what a few companies throughout the country are doing in the matter of substituting machines to make labor less arduous and release man-power for more important work, but to indicate or suggest to thousands of employers the advisability of investigating all manual tasks and determining whether or not the work can be done with greater safety and economy through the employment of purely mechanical means. Search has shown that upward of 50 per cent. of the cost of the necessities of life to the average citizen goes to cover the charges incurred in handling and transporting goods. It is also a fact that during the past two years the public has suffered severely from the evil consequences of unauthorized outlaw strikes which would never have taken place if there had not been such a scarcity of workers as to make it impossible for employers to find men to take the places of the employees on vacation. Surely no one is desirous of seeing a condition of affairs in this country where men are unable to obtain employment. On the other hand, the whole nation pays a dear price when the situation is such that workmen and some of their organizations can violate their contracts with impunity, at the same time resting secure in the knowledge that their jobs cannot be filled by others willing to work.

There never has been a time when it was more necessary for American employers to requisition at once every mechanical expedient which will enable them to use the present high-priced labor on the most important jobs, thus obtaining for each dollar expended as

much output per individual as was produced in former times. The greater utilization of mechanical power means the shifting of the burden of the world's most toilsome work from the shoulders of man to the harnessed forces of nature.

Mechanical Freight Handling. Less than ten per cent. of the freight that passes through terminals in the United States is handled by machinery. Hardly more than one third of American manufacturers are familiar with mechanical methods for handling materials. Only one sixth of our docks and piers are supplied with up-to-date mechanical handling installations, and not more than one fourth of our railway terminals are equipped with modern mechanical handling devices.

There are approximately 2,500,000 freight cars now in use on American railroads. These are moving in trains only 9.03 per cent. of the time. Assuming that every car is released before demurrage starts, it has been found that the cars average 22.58 per cent. of the time in being loaded and unloaded. This indicates that 68.39 per cent. of the time of all cars is wasted by repairs, switching, and unnecessary delays. If mechanical means for loading and unloading cars were to be provided, so that one hour might be saved each day for each car, it is evident that the total saving would amount to something like 2,500,000 car-hours per day, which would be equivalent to adding more than 100,000 cars to our present supply of such rolling stock. Conservation of this kind just now would be of great benefit to many industries.

One city in Ohio recently effected a complete installation of a modern method for the handling and transfer of freight between seven railroads and twenty-

eight stations located in various parts of the city. The new scheme already shows a saving of 66,000 freight cars which were previously used in transfer and ferry service. One authority estimates that if the same system were installed in New York City, \$45,000,000 a year would be saved.

Probably the most important feature of the plan referred to is the use of demountable bodies on motor trucks. The next step will probably be the use of demountable bodies on trucks employed to handle general merchandise from the freight stations to the large stores and warehouses in our big cities. This scheme largely eliminates the lost time suffered by trucks standing idle while goods are being loaded or unloaded. When the vehicle reaches its destination the demountable body, or container, can be lifted from the truck by a hoist and the goods removed at leisure. The truck is then ready to take on another container and continue on its route.

The automobile industry is the one line of business that is blazing the trail and teaching American manufacturers the real value of labor-conserving machinery.

Mechanical Aids in Automobile Building. A leader in this movement is an automobile concern in the Middle West. In the yards at this company's works are big locomotive cranes handling such materials as lumber, steel, and coal. Electric cranes traveling on a bridge are used to load the finished autos after they have been boxed for transportation. In the machine shops a wonderful arrangement of mechanical devices eliminates all unnecessary handling of the various parts that go to make up the finished automobile. Continuous moving conveyors make it possible for the machinist to lift the finished part out of his machine and lay it on the

conveyor, which carries the part to the machine next in rotation of operation.

In the handling of heavy pieces, an electric overhead chain trolley conveyor is used. This moving chain is equipped with stationary hooks and travels at the rate of about three feet a minute. When a workman finishes a part he takes the piece out of his machine and hangs it on a hook on the conveyor just above his head. In this way the part is carried to the next operator. The first workman then fixes his attention on another piece that is traveling toward him and lifts this part from a hook into place on his machine. The machines and the conveyor are so timed that there is always an empty hook passing as a part is finished, and an unfinished piece is following close, so that the machine will not be idle for long. This conveyor system also provides ample storage for surplus parts and permits these unfinished pieces to continue their travel entirely out of the way until needed.

In assembling the finished parts that make up the car, the company has devised a system that insures economy and speed. The plan is to place the axles of the automobile on standards set on an endless-chain conveyor. The distance between the axles corresponds with the fixed wheel base of the car. The conveyor moves three feet a minute, and the various parts are placed and fastened as the unfinished car travels forward. First, the frame is laid on the axles, and by the time this part has been fastened the unit has progressed to a point under an opening leading to the second floor. Here a stock rack with compartments containing all of the parts needed for the car, except the engine, body, and top, is lowered by a crane to a position on the conveyor

just back of the frame. The men ride and work on platforms attached to the conveyor.

As the outfit moves forward and the assembling continues, the conveyor crosses pits approximately twenty-four feet long in which are workmen who install and tighten bolts and nuts on the bottom of the car. If the conveyor is moving at the rate of three feet a minute the men in the pits have no more than eight minutes to complete their work. Next comes a twenty-four-foot opening to the second floor, and here the engine for the car is lowered into place by a traveling crane with electric hoists. The workers are now obliged to fasten the engine carefully in place and release the hoist before the conveyor has finished traveling the twenty-four feet.

Later in similar fashion the body and top of the car are lowered into place through openings extending to the third floor. As a result of this rapid and continuous system of assembly the finished automobile is ready to run off the conveyor at the end of a 375-foot journey. In other words, if the conveyor is traveling three feet a minute the car is completely put together in 125 minutes.

It is also worth noting that this same company has an efficient plan for handling all scrap, trimmings, filings, and waste. It has located gravity chutes and drops at different points on each floor, and these are connected to underground passageways. A trailer truck carrying a removable box is placed at the base of each chute or under each drop. Just as soon as these boxes are filled with waste material they are hauled in trains to storage bins, where cranes lift and dump the scrap. Electric tractors reset empty boxes under the loading points in the passageways.

Material Handling in Paper Mills. A big paper-manufacturing concern is also showing the way to many manufacturers in the matter of increasing output through the installation of mechanical methods for handling material. At this plant wood-pulp logs are lifted from the car or barge by long-armed cranes which carry the logs to the base of an electric log stacker. This latter machine is a great saver of ground area, as it permits the stacking of logs to a height of seventy feet. When needed these logs are loaded onto industrial cars and transferred to the chipping machines, from which point the chips are carried by elevators and conveyors to a bin where the material is stored at the rate of 6750 cubic feet of chips an hour. This wood is moved to the digestors by electric conveyors, just as are the chemicals needed to disintegrate the wood into pulp. In fact, in this plant practically nothing is handled by men, except as it is loaded on or off a mechanical carrier.

Savings Effected by Machinery. As an example of savings thus effected by machinery, it is interesting to note that the equipment installed to stack logs and handle coal, ashes, and clay entailed an initial expenditure of \$40,000, but has brought about an annual saving of \$14,354, divided as follows: In the handling of coal, \$3580; in stoking, \$7250; and in ash handling, \$3524. After deducting \$5600 for the year's operating expenses, amortization, and so on, we still find a net saving of \$8754 annually, or approximately a 22 per cent. return on the investment. The company further states that since the new equipment was put in, the power plant is generating 20 per cent. more power and handling something like 14 per cent. more coal.

Such plants as those just described indicate plainly

the line of advance that must of necessity be followed if American industries are to maintain a place of leadership in the world's business. Competition between individual companies is certain to speed up the use of trucks, tractors, conveyors, and cranes in our larger industrial plants. The chief need of the moment, however, is for speedy relief in freight handling at railway and ship terminals.

One of the country's leading authorities on material handling compiled figures recently that indicated savings of from 10 to 80 per cent. over old methods by freight-handling plants that have put in new and modern machinery. He estimates that the average saving that results from the installation of up-to-date equipment is 40 per cent.

Roughly speaking, 1,000,000 men are engaged in freight handling in the United States in railway and marine service. Assuming that these men only get three dollars a day and work 300 days yearly, their total wages would amount to \$900,000,000. Adding to this the cost of handling freight at other points, it is evident that transportation and other companies pay out considerably more than \$1,000,000,000 annually to freight-handling employees. If we could save 40 per cent. of this expenditure the amount so conserved would be an item of importance in the nation's industrial life.

Late figures show that 300,000,000 tons of miscellaneous freight are handled twice at marine terminals and 600,000,000 tons are twice handled at railway terminals and stations in this country each year. One third of the cost the ultimate consumer pays for his goods goes to cover transportation charges. A careful

examination indicates that one half the freight cost on goods given an average haul is due to the high charges incurred in terminal handling. It costs more to load a box of canned tomatoes on a car in Chicago than it does to carry it from Chicago to New York. It also costs more under the present system to transfer a barrel of flour over the wharf to a ship in New York than to carry it on the same vessel from New York to Liverpool.

Labor-conserving machinery and lots of it is one answer to the present problem that has resulted from a scarcity of supplies, low production, and a shortage of men. No talent or skill is required on the part of managers who solve their difficulties by always increasing prices and making the consumer the goat. The worthwhile manager of to-morrow is the fellow who finds his way out through the ingenious application of his own brains to holding down costs by increasing efficiency.

CHAPTER VI

ADVERTISING AND SELLING

Selling as an Art—Selecting a Salesman—Value of Imagination in Selling—Analyzing the Market—Methods of Approach—Psychology in Selling—Influence of "Price Factor"—Handling Salesmen—Making Students of Salesmen—Concentration and Price—Merchandising Plans—Department Store Selling—Aids to Field Salesmen—Why Sales are Lost—Advertising by Mail—Window Displays—Training Salespeople—Telephone Courtesy as an Aid to Sales—Retail Selling Schemes—Retail Selling Plans of a Public Utility—Three Methods to Stimulate Sales—Importance of Sales Letters—Advertising Campaigns—Advertising Typography—Color in Advertising—Benefits of Repetition.

During the past year or so the science of selling has bid fair to become more or less of a dead art. The buyer has been the aggressor and the man with goods has been able to assume the attitude of one who bestows a favor. However, a change has come about. Natural laws have again become operative. Purchasers refuse to be stampeded and the fellow who gets an order will have to say more than "Good-morning" when he makes a call. All of which points to the wisdom of brushing up on the elementary principles of selling.

In normal times confidence is the foundation of salesmanship. When it is gone business disappears. No man was ever so clever that he could make many sales where confidence was lacking. Faith in an article must be established; the selling effort is a minor operation and should be planned to follow, not precede the building of confidence.

In the business of selling as in the practice of law, the burden of proof should rest with the plaintiff. Yet many sellers try to shift this load on to the buyers. Experience has proved the folly of pursuing such a plan, and has taught long-headed business men who are seeking permanent success that the merchant or manufacturer with goods to sell must, by the very nature of things, be on the defensive, and prove his claims. No great and lasting business enterprise was ever built except by men who always assumed that no single transaction is considered closed until the customer is completely satisfied. Such a policy breeds confidence of the highest order.

One salesman who is said to have no equal in his particular line attributes much of his success to the fact that he never knocks his competitor's goods. He arranges his selling talk so that the good points of his own merchandise are brought out in the mind of the buyer above the strong points of his rival's proposition. He consistently adheres to the policy of never mentioning the name of any competitive firm unless compelled to do so in answer to specific questions. It is his plan to agree that his rival's product is good, but prove that his own goods are better. In doing this, and without mentioning names, he uses the chief talking point of his competitor as a starting point on which to build a superior argument. If his rival's principal selling argument is a stylish finish he endeavors to show that an expensive finish is a serious mistake; the money thus used should be expended in providing greater durability or comfort.

Many salesmen fall down through failure to realize the importance of keeping promises. It is fatal to future business when a buyer discovers that a seller's

promises are so hedged with conditions and reservations that they are of no value in a pinch. It is likewise deadly if the customer discovers that the salesman's enthusiasm has disappeared after the sale has been made. Modern business men have come to value service more than merchandise. If the prospective buyer is himself a retailer the salesman must fix in his mind that this man is not primarily in the business of buying—he is himself a seller, and must be talked to in terms of sales, not goods.

Getting down to the personal touch in selling, every good salesman has learned that he must first sell himself on his own proposition before he can hope to convince his prospective customer. Those who attribute much importance to a proper knowledge of psychology in salesmanship maintain that every seller should approach the buyer in the sincere belief that he is extending the prospect, if not a real favor, at least a real opportunity to make money and improve his position. This attitude of mind, they say, automatically gives the salesman the right handshake, the proper manner, and the correct line of reasoning needed in his work. Diffidence and apology in the seller's attitude are not conducive to business.

So thoroughly convinced are our live modern salesmen of the importance of their mental attitudes toward their prospective buyers that most of them will confess to the use of a few pet mechanical tricks for putting themselves in the desired frame of mind. A surprising number employ some variations of the trick of suggesting to themselves upon meeting a prospect for the first time: "Now, I like this fellow and he likes me!" That sort of thought in the seller's brain cannot help but

communicate itself to the muscles that control his physical bearing. No one needs the assurance of a professional psychologist to realize that with such a feeling present it is physically impossible to proffer a flabby, nervous handshake.

And speaking of handshakes—whether or not to shake hands at all is a delicate problem, even for the experienced student of the salesmanship branch of applied psychology.

Another trick which practically all convincing salesmen consciously or unconsciously practice is the childishly simple one of straightening their spines and holding their heads erect, lobes of ears in line with shoulders. If you want to register indecision, just hold your head on one side. At some moments even such a slight suggestion of indecision on the part of a salesman is capable of keeping him from getting on the other side of the ground-glass door of the “man to see,” or of turning the scales against his proposition in a moment of critical decision.

A large and varied collection of polite ways in which to ignore the prospective buyer’s “No” is a golden treasury for the man with something to sell. The habit of eliminating from his talk all expressions which make it easy for the prospective buyer to turn him down is a difficult and precious one for the salesman to form. It is just as easy to say “You could use some more” as it is to say “You couldn’t use any more, could you?” Nothing is less difficult than to suggest to a prospect objections which may kill a sale. Many an unimportant defect in this imperfect world would never have been noticed if attention had not been called to it by the apology of a well-meaning soul who was anxious to please.

The salesman who, either in print or by word of mouth, can successfully appeal to the pocket nerve of the American woman has a veritable bonanza to tap; for the American woman is the greatest single agency through which money is spent in the world to-day. It is not unchivalrous to record that perhaps the most powerful method of selling appeal to women is through the vanity motive—for most women have a maximum of vanity for their entire family as well as for themselves. Clever salesmen can be forced into admitting that it frequently pays to keep in mind the well-known feminine tendency to decide first and reason afterward.

One of the greatest authorities on salesmanship expresses the opinion that the most successful sellers are those who try to help their customers by contributing valuable and practical suggestions each time they call. No one is in better position to gather up successful ideas than a salesman who visits and talks with business men in different communities. Many retailers have very little opportunity to travel and investigate the methods employed by other merchants, and such dealers are always glad to meet the observant seller who can bring them new and intelligent ideas.

It is impossible to change the nature of man after he has been hired, and for this reason some salesmen, though given more training than others, fail to develop into competent sellers. However, such essential qualities as self-control and politeness can be inculcated into most men and will always serve to strengthen their selling personality. It is also possible to impress a salesman of even mediocre ability with the importance of studying and capitalizing the methods of his competitors. At the same time he must be taught that his job

is made up of these problems: To rouse the interest or curiosity of his prospect; to create a desire for something; to satisfy the buyer's reason with regard to that something, and to move his will. Above all, the salesman must know enough to get out before he has talked himself out of the objects he has gained.

Selling as an Art. Perhaps the most widely discussed subject in business to-day is the art of selling. Whether this is true or not, the fact remains that practically every human being is a seller of something. Efforts are now being made to develop definite methods for use in the selection of salesmen. Other investigators are endeavoring to lay down rules of a scientific nature to govern the problem in action. Yet strange as it may appear, this oldest of all occupations continues to be practiced in conformity with the personal ideas of each individual salesman, rather than as an exact science with proved formulas.

However, this deficiency in the matter of a prescribed course of procedure in selling goods is due more to a lack of organization of present available information than to any dearth of knowledge on the subject. The time has passed, if it ever was here, when a salesman, to be a success, must depend chiefly on good fellowship and an ability to entertain. These qualities, though valuable, now rank below creative ability and the power to present in forceful manner the proper appeal to each particular prospect approached. In other words, salesmanship has acquired the dignified distinction of being a profession demanding a grade of intelligence and education that was not the case some years ago when the average salesman was little more than a hired man who traveled a fixed route and recorded orders.

The modern sales manager is a combination psychologist, statistician, merchant, and analyst. He is no more born to follow his pursuit than is the average doctor or engineer. The secret of success in selling is chiefly a willingness to devote the necessary time and study to learning the business.

Selecting a Salesman. One of the greatest difficulties is the selection of men to act as salesmen. The new applicant may have talent to sell goods and yet possess very little ability to sell himself. This truth, coupled with the prevalent tendency of most employers to follow their intuitions and prejudices rather than cold facts in hiring men, makes it advisable never to employ a salesman during the first interview, and if possible to secure an opinion of the man from two or more of the company's officers. One concern requires that four of its executives shall interview each applicant for a salesman's job, and that the average of the four ratings shall determine the new man's qualifications.

The physical characteristics of an applicant provide no accurate measure of the man's mental capacity. It is, of course, understood that there should be some difference in the style and mannerisms of a man who is wanted to sell jewelry to Fifth Avenue stores and a salesman for paints and oils in Texas or Oklahoma. It is fatal to provide a situation where the prospect is made to feel that the seller is of another class. The merchant or farmer in a soft hat and shirt sleeves will not mix well with the salesman who carries a cane and wears spats. Physical appearance, therefore, must be taken into account to see that the man who is employed will not appear out of harmony with the trade and surroundings he must meet. However, the difficulty in picking the

right man for a selling position lies in getting a true slant on the newcomer's mental and moral traits, which qualities are not always worn so they are in plain view.

The use of application forms is helpful only in that time may thus be saved through the elimination of interviews with men who might be put out of the probable or possible class by certain unfavorable facts that their written answers to specific questions might reveal. The native ability and general intelligence of a prospective salesman are the important questions to be determined, and these distinctive attributes can be discovered only after careful search and the application of simple but proved scientific tests. Some managers have prepared charts with two columns of qualities, the virtues being known as plus qualities, and the deficiencies being called minus qualities. In this system, after the applicant has been interviewed one or more times, the employer fills the chart by giving the man a certain grade for each quality. The total of the minus qualities or deficiencies subtracted from the total of the plus qualities gives a figure that represents in a general way the merit or probable value of the applicant. Among the plus qualities are energy, persistence, loyalty, appearance, personality, and imagination. The minus column includes laziness, ill-temper, bad habits, easily disheartened, jealousy, and conceit.

Some men are born with certain qualities that are essential to success in salesmanship, and yet these same men are frequently excelled in the matter of results obtained by other individuals who have been obliged to acquire the necessary qualities by education and cultivation. In the business of selling goods, a man must possess staying power and be unable to recognize defeat.

He must be capable of quickly adapting himself to different temperaments and surroundings. He must be versatile, fairly entertaining, able to talk intelligently about other lines of business than his own, and possess sufficient magnetism and persuasive force to bring conviction without bluntly discrediting the ideas and opinions of the opposition.

Many concerns now prefer a well-balanced staff of average salesmen to a mixed force containing a couple of "stars" and a lot of tail-enders. So-called born salesmen generally work in spurts and do not easily absorb either instruction or information that comes from the directing force higher up. "Star" sellers often demoralize a whole department through having all of the general rules shaped to fit men of their own personality and ability. Many companies have lost good material through the petting and favoritism shown to an egotistical, undisciplined "star" salesman. Without teamwork, success in any organization is impossible.

Value of Imagination in Selling. The modern salesman in most lines is expected to devote more time to selling intangible things like service and prestige than merchandise. Our great manufacturing concerns spend millions of dollars in national advertising, and the salesman must know how to sell the idea of the greater salability of an article due to the wide educational work of the manufacturer. The present-day seller of goods must be able to convince his prospect of the value that rests in the reputation of the maker, in his policies and the service that is rendered. It is this new turn that has been given to salesmanship that makes a failure of many men whose instincts are all for material things. Such salesmen have too little imagination and find it

difficult to succeed in the selling of such things as good will and other intangible merchandise. The present time is a day of specialties and through the character of the container, the finish, and the trade mark, even goods that once were staples have been converted into specialties, the distribution of which requires a wider and more diversified selling ability than was needed in former times.

The salesman who would be a success must fix in his mind that he is selling his prospect not merchandise primarily, but the expectation of a later profit. The seller of goods must be an optimist or he will be too easily discouraged, and he must be an analyst so that he can base his campaigns on sound principles rather than expedience. Selling experience has taught that each move must be based upon specific information and not hope and enthusiasm. When the facts are clear and a decision has been made, prompt action must follow before the opinions arrived at become obsolete and valueless. Patience in preparation and vigor in performance are essential to success in salesmanship. Some selling organizations are 90 per cent. motion and only 10 per cent. accomplishment because the manager attempts to conduct a campaign without first basing his different moves upon a careful and thorough analysis of the field and all relative conditions.

Analyzing the Market. One experienced manager of sales says:

I preach to my men that nothing is impossible until all of the facts are in and it is plain that the thing can't be done. Every man on my staff must be unswerving in his loyalty to the company rather than to me personally. It is also necessary that each one shall understand that in the

matter of all breaks the company must be given the long and favorable end and not the customer. I have also found that as a general rule the article should be manufactured wherever possible to suit the market and the selling plans, rather than that the sales planning should be shaped to fit the merchandise. Selling is the most important division of business, and it is not a question of what can be made but what can be sold. Even the question of mechanical excellence and price must be based on the possible market and the probable demand. An article that can be put forth as embodying the ideas of an acknowledged authority in that particular field will often have a better chance and an easier road to travel. Goods that are not made to attract in appearance will frequently fail to get an opportunity to prove their merit. Any number of successful companies sell merchandise that costs less than the container in which it is put up. People pay for individuality in an article, and for this reason each product must have at least one important quality in which it excels all of its competitors.

Methods of Approach. Concerning the proper methods of approach and action in selling goods, there is a diversity of ideas almost as numerous as there are selling organizations. There are some principles, however, that appear to have become accepted practice in many of the larger sales organizations, and a few of these may prove interesting. It is fundamental in a salesman's education that a possible buyer may be able to control his speech but not his eyes and facial expression. The seller of goods must quickly determine the character of man he is trying to sell to. Some men are most easily reached by the ear, some by touch, and others by the eye. The first class will listen to talk, the second will want to feel the article, while the eye-minded folks usually prefer to read through pamphlets,

catalogues, and advertisements in order to get their information or observe the merchandise themselves. The successful salesman must quickly discover these individual traits of his customers and cater to them. It is foolish of a salesman to waste time in trying to demonstrate an article to the man who can be sold by touch. This prospect's mind has been fully reached with a strong argument the moment he has come into personal contact with the object.

The most successful sellers of goods concentrate their sales appeal by calling particular attention to two or three vital points in an article rather than by offering a wide number of arguments. Before the salesman can sell his merchandise he must sell his own personality. After having made good in this one particular he must stick to plain, sincere talk and not slip off into oratory. If observation tells the seller that his prospect is highly educated, he must present his complete line of facts. If the buyer, however, is of the heart type, the seller's aim must be to reach the imagination or emotion of his prospect. No more powerful argument has ever been invented to persuade a prospect to buy than a bunch of signed orders, showing that other merchants are favorable to this particular line of goods. If the prospect finds the name of a friend or competitor on one of these orders, this style of argument is doubly strengthened. Testimonials do not compare in value at all with actual orders.

Psychology in Selling. Many salesmen pride themselves on their knowledge or ability to analyze character through a study of a man's physical appearance. The most common conclusions are that gray or blue eyes indicate a cold temperament and precise methods.

Thin lips with such eyes indicate a still lower temperature. Straight eyebrows indicate self-reliance, while eyebrows that are arched express temperament. Small eyes denote an analytical mind, while large eyes indicate imagination and feeling. A projecting forehead is supposed to show some weakness of will; a broad, high forehead analysis and perseverance, while a retreating forehead indicates perception and imagination. A large mouth with full lips manifests energy, good sense, and good nature. A small mouth suggests pettiness. The large chin represents a practical disposition and a persistent nature; the small chin indicates petulance and vacillation.

While professing to believe in the possible value of such physical signs of character, most salesmen have discovered that they can get a good line on the real qualities of their prospects by carefully noting the condition of the buyer's office, desk, and surroundings. It is further true that in many cases a man's speed of speech is a fair indication of the celerity of his mental processes. Some prospects are filled with questions and such individuals must be supplied with a quantity of facts and detail. Other buyers are annoyed by detail and must be approached and won through arguments of a general nature, holding forth the large advantages of the merchandise. The psychological moment in the art of selling is when the buyer is supposed to sign the order. Many a salesman has succeeded in winning over his buyer and then has talked himself out of what would have been a sure sale if he had only known when to stop. Ability to determine the moment when conviction has been established is one of the highest qualities of selling. The salesman

who does not save hammer blows for use in "closing" has not prepared himself in thorough manner for his work.

Influence of "Price" Factor. It is no longer true that "price makes the market." People to-day are willing to pay a higher price for an article when they know that they are buying security, reputation, style, appearance, or purity with it. One investigator maintains that more articles can be sold at 21 cents than at 19, because of the feeling on the part of the buyer that at 21 cents the article has had a four cent cut, while at 19 cents it has been reduced only one penny. It is likewise true that in the minds of many purchasers the price of an article actually determines its quality. Many cases have occurred where, in testing human nature, articles of considerable value have been offered at a ridiculous price without attracting a purchaser, the conclusion being that when anything is too cheap most prospective buyers are skeptical.

It is the nature of a majority of salesmen to overrate the methods and goods of their competitors and secretly underrate many of the merits of their own products. This condition is due to the fact that the salesman is the one person who always is informed by prospective buyers of the cheapness and excellence of the other fellow's goods. Sometimes the seller hears so much of this talk that he commences to believe it and then busies himself in an effort to persuade his own company to reduce prices. There are cases on record where prices have been reduced to satisfy such a demand, and the result has been disastrous. In several instances of this kind, consumers have refused to buy at the lower price because of a suspicion that the quality of the article has been lowered.

In this new day of salesmanship and sales management we have reached the commencement of an era when scientific methods will be substituted more and more for superstitious beliefs and hit-or-miss plans. All modern companies have learned that a business built on nothing more lasting than personal good will has an unstable foundation. Great corporations have discovered the value of indirect action. The big automobile companies now advertise the joys of motoring, in order to create a demand for their particular product. Large central-station companies producing electricity have gone into the manufacture and sale of electrical appliances, not to make money on these articles, but to create an increased demand for electric current. (The plans followed by one large Chicago public utility in order to eliminate the peaks and valleys in its load are described elsewhere in this chapter.) One large manufacturer of bookcases increased the sales of this product by carrying on a campaign of education to encourage the wider reading and purchase of books.

Handling Salesmen. Sales managers have also discovered that there are better ways of handling men than those that prevailed in years past. If a salesman who has shown some degree of ability proves to be a failure in one locality, he is now transferred to another field or a different line of work where he may have a second chance to prove his worth. The day of the man with many "side lines" has passed and the hour of concentrated thought and ability has come. Few managers now drive their salesmen on by continual fault finding. The newer plan is to take the man completely into the confidence of the company, ignoring the fact that an occasional employee might undertake to profit by the

inside knowledge he has gained of general business conditions and the company's plans. It is now understood that nagging letters reduce rather than increase the efficiency of the average salesman. Continual criticism from the home office will do more than anything else to kill the seller's ambition. Wise managers now find it best to encourage a salesman until there is no further doubt that the man is a failure, when his services are promptly dispensed with.

Buying is but the climax of confidence. The creation of this confidence in buyers can be accomplished only by an efficient selling organization which cannot be created in an hour. Every sales organization should be regarded as the motive power of the company. It is likewise an accurate reflection of the sales manager's ability and the company's policy. When a corporation first starts its green salesmen as students in the factory, then teaches them the principal selling points of their merchandise, and finally trains them to meet objections skillfully, it has created a seller who is equipped to overcome exceptional difficulties and secure satisfactory results for the company. If, in addition, this same concern does not overlook the fact that its salesmen cannot sell an article in which they, themselves, lack confidence, and further that the best kind of enthusiasm is not that developed by "ginger talk," but by the opportunity to earn a handsome money reward, the company may rest secure in the wisdom of its policy and the solidity of the business foundation it is building.

Making Students of Salesmen. Not ten per cent. of the men and women now engaged in business are sufficiently analytical. At first glance this may appear to

be a hasty assumption, but an investigation will show that the statement is true beyond doubt. Thousands of retail merchants throughout the United States employ hundreds of thousands of clerks, who sell certain kinds of goods year in and year out and yet have no knowledge whatever concerning the nature and sources of supply of the raw materials from which the product that is being sold has been manufactured. How many shoe clerks know where the various kinds of leather come from? They talk glibly to customers about high prices and their causes, but not one shoe clerk in a hundred is familiar with the facts pertaining to the production of goatskin, which comes not from America but chiefly from the other side of the earth.

The general ignorance of shoe clerks concerning the production of leather and the processes of shoe manufacture is no more pronounced than is the lack of knowledge of other kinds of clerks with respect to the various products they handle. The following story will illustrate this point:

A man walked into a big automobile salesroom where he contemplated buying a car. The principal problem that developed in his mind was whether he should purchase the larger or the smaller car of this particular make. The automobile salesman, who was far from being an amateur, agreed with his prospective customer that the heavier seven-passenger car would consume considerably more gasoline, oil, and tires than the lighter machine.

The salesman went no further with his analysis, and the customer left the automobile salesroom with the matter still unsettled in his mind.

To a friend he said: "With the price of gasoline soar-

ing as it is I am rather inclined to believe that the big car will cost a couple of hundred dollars more to operate each year than the lighter machine."

"How many miles do you drive?" asked his friend.

"About 6,000 a year," he replied.

"That means," his friend said, "that if the smaller car runs sixteen miles on a gallon it will use 375 gallons during the season. Further, if the large car runs only twelve miles on a gallon of gasoline it will require 500 gallons each year. This means that the larger automobile will consume 125 more gallons of gas than the smaller car, and at thirty cents a gallon the big auto will cost you about \$37.50 more than the small one."

A little additional figuring indicated in like manner that the increase in running expenses of the seven-passenger automobile, so far as tires, oil, and grease were concerned, was far less than at first had seemed likely. The principal question in the customer's mind and that of his friend was, "Why should an experienced automobile salesman permit a prospective customer to go away under the impression that the difference in operating costs between two cars is three or four times as great as is actually the case?"

It is safe to assume that this identical problem must have confronted the salesman dozens of times, and though a few minutes of figuring would have provided a definite and satisfactory answer no such thought had been given the question.

The day of the superficial man is rapidly passing. We have entered an era when intelligent people demand facts. The picture drawn of the average salesman applies with equal force to the majority of employers. In fact it is hardly necessary to say that the salesman

is but a reflection of his boss. If the man higher up is content in ignorance concerning the past and present history of his merchandise it is hardly reasonable to suppose that the clerks who work for him will be inspired to study the goods they handle.

Recently an investigator carried on an examination in the retail hat business of one of our largest cities, and the fact was developed that less than 30 per cent. of the managers and salesmen in this particular trade were informed concerning the early history of hat manufacture and the important scientific and industrial advances made in recent years by the art.

There isn't a business under the sun, from shining shoes to selling locomotives, but is filled with romance. It is also true that the complete story of every profession and industry is free for those who are willing to devote a few hours to study in any town or city library. Notwithstanding this easy availability of essential trade and technical information, thousands of people devote years to commercial pursuits without adding a mite to the knowledge they started with. Is it any wonder, therefore, that imagination and enthusiasm are so lacking in the common run of people who are employed to sell?

It could hardly be otherwise in a situation where the average customer knows as much about an article as the salesman does.

The manager of one large store in a Southern city found himself up against this very problem. It did not require any extended research on his part to discover that though his salesmen were veritable sharks in the matter of baseball statistics they were tail-enders when it came to the knowledge of the special

lines of goods they sold. This manager started a beneficial current of thought in the minds of his workers by selecting as the new head of one department that clerk who made the best showing in an oral examination covering the details of the class of merchandise handled in this department.

A general business policy of selecting for advancement those employees who have acquired the greatest amount of knowledge concerning the goods they handle will fill the reading rooms of many libraries with salespeople who have suddenly developed a desire to absorb interesting and useful information covering the principal commodities of everyday life.

Concentration and Price. "Enthusiasm is the sparkle in the sapphire," said a famous automobile manufacturer talking to a number of salesmen. "Better methods come when the boss warms to his men—for then, and only then, will the men warm to the boss."

The secret of advertising and selling goods is a thorough understanding of the action of what we call the five senses: Sight, feeling, atmosphere, taste, and hearing. To these should really be added a sixth sense, known as equilibrium or balance.

In every advertisement there is a chance to satisfy two or more of the six senses. In selling an automobile to a prospective customer, for instance, there is opportunity, as well as necessity, to satisfy requirements.

When the car is sold, the sale is not complete by any means. In fact, the chief transaction has just begun. If the manufacturer has not supplied quality goods; if the advertising has deceived; if the salesman has exaggerated; if the car offends—then there will be a dissatisfied customer.

In every business a certain article or product succeeds in so far as it is successfully adapted to the needs of a certain class of people. To cite the automobile again, the man who gets a little money and is tired of walking aspires to own a car and generally buys the cheapest one made. When he reaches a degree of prosperity which enables him to advance a step higher in the social scale, he chooses a slightly better car. Then he wants to pass his neighbor on the hills and he gets a machine with more power. Now the wife puts a hedge around the front yard and buys a victrola, and the family has to get a car of style and individuality. If he goes on up the scale, again he changes and buys the best motor made.

The question has often been asked: What has price to do with the advertising and sale of anything? The answer is—everything below a certain point and nothing above a certain point. In every city there are three separate and distinct merchandising streets: one where price is the sole governing factor; the second where both price and quality influence the sale, and a third where style alone predominates. Each manufacturer must first of all select a class of people to whom he is going to sell, and then remember that no one concern can sell them all.

It is a good idea also to know just how large are the various classes of prospective customers. We have more than 100,000,000 people in the United States, but in 1918 only 437,036 paid an income tax. A great majority of our 6,000,000 farmers did not show up at all. A recent census informs us that there are 27,304,177 family groups in the country. Of these, 7,288,000 report an annual income of \$850 or less.

There are 15,542,000 with incomes between \$850 and \$1500. Only 2,798,000 get from \$1500 to \$2000, and 1,247,000 have incomes between \$2000 and \$3000. Of the remaining families, 157,000 average up to \$5000, while 150,500 get between \$5000 and \$10,000. Only 121,699 family groups receive an annual income of more than \$10,000. Such figures indicate the size of the field that exists for the sale of articles of different prices.

Many salesmen complain because they cannot sell every prospect. The real truth is that, generally speaking, six out of ten possible customers are not the right people to buy the particular article or commodity in question. Too many underestimate the importance of concentrating efforts upon that class to which the merchandise is intended to appeal.

It should again be emphasized that price has nothing to do with sales of certain articles above a specified class. Here is a cake of a certain famous soap. What was paid for it? A few women might be able to answer, but if they had to spend a few cents more to get this same soap, they would gladly do so. The fact is the article does not sell on price alone. The real salesman to-day talks price last, not first.

Merchandising Plans. There are two kinds of merchandising plans. The first is founded on the idea that it is best to sell fewer goods but at a high price. The other scheme is based on the belief that greater success comes from selling large quantities of commodities, with only a small profit on each article. The ten-cent store is the chief exponent of the latter idea in America. All of its success depends on the skillful execution of high buying orders. Purchases for the stores must be in such volume that manufacturers can

afford to sell their products to them at a heretofore unheard-of figure.

Many people hold the belief that the ten-cent stores secure their goods from their own factories. This is not true; one company which operates over a thousand such stores does not own a single manufacturing plant. It does possess unparalleled buying power and this affords multiplied efficiency. As prices of materials have advanced, so have the sales. Eight years ago the annual sales were \$50,000,000; now they are more than double that amount. Working independently, the ten-cent stores would have failed in recent years. Under one directing management, they have grown in size and profit, and the controlling interests are fast working toward a realization of their aim which is to have a store in every worth-while town in the United States and Canada. Right here it might be well to state that the ten-cent store of the East charges a slightly higher price in the West and in Canada.

The reader may gain a better conception of what it means to buy for a thousand such establishments if a few special cases are recited. Take for instance candy. Everyone knows what a prejudice there is against cheap grades of candy. The ten-cent stores went after this business on a big scale. They claim boldly that their candy is 100 per cent. pure; that it contains no poisonous coloring matter or inferior ingredients, and they challenge investigation. How can it be done? Perhaps the answer is that these stores last year sold 90,000,000 pounds of candy—enough to fill a train of freight cars that would extend nearly two thirds of the distance from Washington to Baltimore.

The buyers for the company make it their business to

show skeptical manufacturers how a new plan for increased production can be worked out, and how great are the possibilities. Sometimes they outline a scheme for plant enlargement or detail a method that will effect great savings in the cost of production. One of the buyers was attracted by a finger ring that was being retailed at 50 cents. The manufacturer laughed when approached and said it was absurd that anyone should believe it possible that he could make this ring to sell for 10 cents. He was doing very well with the article and was quite satisfied with his sales of 450 dozen that year. However, the buyer kept at it and convinced the manufacturer that the plan was feasible. As a result the ten-cent stores during the following year sold 720,000 of these same rings.

Think what it means to a manufacturer when a buyer comes to him and says, "I will agree to take nine million yards of your curtain material each year." Or let us take the case of glassware; imagine what it means to the factory owner to know that the ten-cent store affords him an annual market for 350,000 barrels of such glassware. Of course he can sell it cheap for production costs always go down as output goes up, if a management is efficient.

In one year the ten-cent people sold enough enamelware to load a freight train seven and a half miles long; they disposed of 54,000,000 handkerchiefs last year and this was accomplished at a time when raw materials of the kind were scarcer than ever in history. Before the war, the company bought 121½ per cent. of its merchandise abroad; to-day it buys nearly all of it here in the United States. Celluloid dolls, Christmas-tree ornaments, and many similar products came from over-

seas, now they are "made in America." Prosperous communities are growing up where these new industries are established.

One thing that is unique about the ten-cent store is its high degree of individuality notwithstanding its central control. Each shop is made to conform as much as possible to the life and needs of the community where it is located. People in the South, the West, and the North do not all want exactly the same things. Each store manager hires his clerks and assistants in the city where the business is located.

The big company that practically dominates this method of merchandising has its main offices in New York where the overhead staff of executives hold forth. The general business is operated, however, by dividing the country into eleven districts, each controlled by an administrative officer known as a district manager. The largest district includes 128 stores; the smallest one has 50. Some of the stores are in the most fashionable shopping centers where one would imagine there would be only a limited demand for articles so cheap in price. But strange as it may seem, one of the largest and most successful of these stores is situated on one of the busiest corners of New York's most exclusive street—the famous Fifth Avenue. On the day this store opened for business, more than 45,000 customers entered its doors.

Although the big thing in this business is the original idea that grew in the brain of a plucky farmer boy who started as a clerk without even a wage to pay for his services, still it is true that it requires more than a single practical notion to build a profitable commercial institution of national scope. Back of it all there must

be an organization based on principles of justice, or the grand idea could not be put into effect. The virtues of the big concern operating more than a thousand stores are easy to discover. First, there is the rule that the company shall never go outside its organization for a man to manage a store or to take a higher position. All of the officers began at the bottom. For every job there is an understudy. Second, there is the profit-sharing plan whereby every man in the business receives his compensation on a basis of department earnings. The regional officers are rewarded in proportion to the returns in each one's particular district, and the higher executives have their compensation based on the company's total earnings. No single stockholder controls as much as twenty-five per cent. of the capital. Every salesgirl or other minor employee receives a cash annual bonus after one year's service. This is increased by the same amount each year for five years.

Department Store Selling. During the past year or two, when the demand for most kinds of merchandise was exceeding the supply, many retail stores tried to conduct their business as though the reverse condition were true. There is no greater mistake then to permit prosperity to breed a spirit of independence in salesmen, for such an attitude on the part of the seller will kill good will; and though the injury to the business may not be evident to-day, there is another time not far off when the volume of goods may be greater than the volume of customers.

Neither advertisements nor salespeople should be permitted to scare customers into buying. It is a poor plan to base sales on human fears and weaknesses. No one can be sure just what prices and conditions will be

six months hence, and for this reason all talk founded on the argument that "If you don't buy at once you will probably pay more or fail to get the stuff at all a few weeks from now," should be ruled against.

There is one thing a customer seldom forgets, and that is having been done by a salesman. Scare thoughts in business generally end in much the same manner as did the story of the youngster who cried "Wolf!" when there was no danger.

If one thing more than another can be said to be responsible for business success, it is the undeviating policy of hewing straight to the line of truth in dealing not only with customers, but also with employees. When there is a sale of goods at reduced prices in any department of a store, it should be established that the reduction is just as advertised. This should be done not only as a matter of honesty, but because a salesman, in order to do efficient selling, must have full faith and confidence in his company's actions as well as its goods. Knowing that the cut in price is real, the seller has less trouble in convincing the customer that the sale affords a real opportunity to pick up a bargain.

Aids to Field Salesmen. One large concern, employing more than fifty salesmen, who are on the road for at least a month at a time, saves a considerable sum of money by supplying the members of its selling force with funds for expenses in the form of checks rather than cash. Before a salesman leaves the main office on a new trip, the accounting department carefully estimates what he will need, and checks for the proper amounts are written and dated ahead. These checks represent money in the local banks which is drawing interest up to the time the salesman cashes the check.

By using this plan, no money is drawn for traveling expenses until the day it is needed.

This same concern recognizes a simple truth that is entirely overlooked by a majority of the big business corporations here in America. It has arrived at the conclusion that it is both foolish and inconsistent to practice a policy of keeping the salesmen of other firms at arm's length in its own offices, and at the same time expecting that the men who represent it in the field will be received by all prospects and customers with promptness and cordiality. The company's telephone girls and office boys have been carefully selected and trained. Salesmen who call at the main office of the concern to sell the company raw materials or other supplies are not required to give their whole pedigree, as if they were escaped convicts. Early in the game, the management traced a number of lost orders to the indifference and rudeness of office boys and others to the visiting salesmen of outside firms. In one case where a salesman came to sell the company a quantity of raw material, and met with a cold reception, the supply of much needed material was immediately offered to a competitor, who by purchasing it was able to keep his factory going at full speed while the offending company had to slow down to part-time work, simply because its office force had lacked in tact and courtesy. Now the company has the right point of view, and accords the salesmen who call the same attention that it expects its customer to give its own representatives.

All of the company's salesmen are supplied with proofs of every advertisement, as well as all circular matter the concern issues. This is done so that the salesmen will not only be able to advertise the com-

pany's advertising, but will always be thoroughly informed about the plans that are being carried forward. Each member of the selling force, after being taught all that he should know about the company's products, is sent into the field largely on his own hook, without being hampered by fixed rules. It has been the experience of the management that iron-clad rules will not make a poor seller efficient, while on the other hand they frequently prove the ruination of that type of salesman who works best when he is not only trusted to proceed in the right way but is allowed to use his own judgment in making important decisions. In other words, the men are educated rather than bossed.

In one way or another, the sellers are kept in a perpetual contest, one with another, and those who make the best showings are rewarded. Competition not only makes good salesmen work better, but it eliminates those who are incompetent. All of the members of the selling force are expected to standardize their sales talks. It is emphasized, however, that this standardization should not be carried to the point of memorizing a regular speech, but shall consist in simply keeping in mind a certain number of important points, each of which must be covered before the salesman ends his canvass. When a seller does not follow this plan, he is always likely to overlook some special thought which may be of vital importance in clinching the order. In the case of a doubtful prospect, the salesman may fail through omitting only one argument out of, say eight or nine that might properly be included in his talk.

Why Sales are Lost. The principal causes of failure to effect a sale are lack of care in arranging a proper hour for the sales interview—many orders are lost

through inopportune interruptions; neglect to study a prospect and discover the right angle of approach; timidity and a loss of confidence in the face of the customer's coldness and lack of interest; failure to uncover the principal objections of the prospect so that such objections can be attacked and overcome, and last, but no less important, an untidy appearance and an excuse-me-for-living manner which indicates a lack of prosperity and success.

Advertising by Mail. In advertising by mail, many department stores have found that a four-page folder is a more economical medium than a smaller and thicker booklet. With the folder there is but little cost for cutting, binding, and trimming, while such a circular can be quickly folded once or twice to fit into a smaller-sized envelope. Such a folder can vary all the way in size from six by seven inches to twelve by eighteen inches. With the smaller size, the piece can be folded once and mailed without being put into an envelope at all. In this plan the address and a one-cent stamp are placed on the front, while the story is told briefly on the inside pages. With a folder of this type it is even unnecessary to use a sticker.

Most successful circulars are written in narrative form. The closer a selling talk approximates to the shape of a story, the more effective it will be found. Actual concrete descriptions in advertising hold attention better than recitals in the abstract. It is always better to follow the line of least resistance in language, as well as in ideas and style. The language of the man on the street may not be highly literary, but it is the kind of talk that will be read with the closest attention. Women can write the best advertisements intended to

attract their own sex. When writing for women readers most men seem to get effeminate and fancy in their syle.

Some of the best department store advertisements contain boxes enclosing lively little editorials on popular themes of current local interest. Such advertisements not only help mold public opinion, but attract attention.

Window Displays. Close attention should be given by retail stores to their window displays. Experienced trimmers work on the idea that it is human nature for the passerby to look first to the right-hand corner, and the trimmers build their displays with this idea in mind. Window-trims are built in accordance with the same principles that apply to a well-balanced page advertisement in a magazine. The leading article on display is usually placed in the right-hand corner of the window.

Never make the mistake of overdressing your window—that is, displaying too great a variety of goods. A window may present a pleasing picture and yet fail to sell goods, because the background draws all the attention. It is best to show a few articles and have them appear against a background that is as nearly as possible identical with the actual background they would appear against in everyday use. Every merchant must remember that his windows become efficient salesmen when properly trimmed.

The primary fundamental is to dress the windows with bright colors. One concern follows the plan of making one window an eye-catcher. Something out of the ordinary is always placed in this particular window. A second window is changed each day and contains a display of that day's bargains. The man-

agement's experience has proved the wisdom of showing only one line of goods at a time in any window. It has also been determined that the best window displays contain a moving object which attracts the eye. Experiments have shown that it is a good idea to place any special article the store wishes to push in the window at the left of the main store door. The customer hesitates and generally looks to the left as he opens the door with his right hand. If equal care is employed in placing the article at strategic points with reference to the elevators, the wrapping counter, and other locations in the store where the customer is likely to go in the course of making his purchases, there is little doubt but that full attention will be obtained for the article that is being used as a leader that particular day. Properly placed placards further enhance the effectiveness of this scheme. One placard should face the customer as he is ready to leave the store. Many of the Western stores now use color lighting in their show-windows. The color screen consists of a slide containing colored gelatin. Generally four screens are available—red, amber, blue, and green. The color is changed according to the kind and style of articles displayed.

Training Salespeople. The hardest task in running a modern store is to hire, train, and hold efficient salespeople. Some of the large stores have established a salesmanship school of their own wherein they teach their employees the history, sources of supply, manufacture, and uses of the various classes of goods sold in the store. In these schools the different individuals are asked to get up on a platform and make typical sales talks. These talks are later criticized in kindly fashion by their fellow-workers.

The store's general manager presides at some of these meetings, and frequently turns them into a school of experience, where the employees present their ideas as to what might be done to improve sales and reduce costs.

The practice of one nationally known store in respect to the training of its salespeople should prove of interest. Every effort is made in this store to teach salesmen the customer's point of view. One purpose in carrying out this thought is to prevent careless buying by qualifying the salesperson to act more as an adviser than as a mere order-taker. On certain occasions picked employees are sent through the store to make purchases in various departments. They later submit reports covering all the incidents of their experience.

Once a month a store meeting, attended by all employees, is held after hours. Preliminary to this meeting a definite list of questions is prepared and handed to each and every worker. The purpose of this meeting is to discover and eliminate all waste of effort, time, and material. Employees are asked to explain how and where they take unnecessary steps or do useless work. Other questions concern the complaints that customers make, and in order to get the real facts each individual worker is requested to make a careful list of customers' complaints four days during each month.

One request was: "Give ten reasons why this store would displease you if you were a patron."

Another question was: "What devices or equipment can we install to increase our efficiency and better our service?"

Under no circumstances should an employee be per-

mitted to enter into an argument with a customer. All salespeople should be taught that it is possible to oversell the prospect, and this practice frequently proves a boomerang. All goods should be sold on service and not on price. The best salesmen have a sympathetic ear and are quick to offer a helpful word, at the same time avoiding all talk concerning their own troubles.

The salesman should endeavor to show his prospect where he is right and not where the prospect is wrong. Above all else the worth-while salesman will say a pleasant word and show a smile when he has lost as well as when he has succeeded. Salespeople should be taught never to ignore the people whom customers bring along to advise them in their purchases. On the other hand, it will be found best for the salesman to direct most of his talk to the companion who is acting as a counselor to his customer. The very fact that the customer has brought such an adviser with him proves that he has confidence in this friend and will depend largely upon this friend's judgment.

One progressive retailer has established a rule that no clerk shall say, "Is that all?" after a customer has made a purchase. His idea is that such a remark provides the purchaser with a direct suggestion to stop buying. In this particular establishment, each salesperson who has a clear record, with no demerits, over a period of two weeks, is given a half-day vacation. This plan has materially decreased the number of errors of the salespeople. If the clerk prefers, the half-day vacations will be allowed to accumulate, and may be added to the summer vacation of the salesperson.

The one kind of clerk that this store will not countenance is the seller who is a natural snob. Such a clerk

is defined as one who gives every possible attention to the rich lady, and then is sadly lacking in courtesy when the customer of limited means appears. No store can depend only on those who are wealthy, and salespeople can seriously damage a business by following the plan of giving their best attention only to the big purchasers. Here in America, the small purchaser to-day may be the one who has the large, profitable account to-morrow.

Telephone Courtesy as an Aid to Sales. There are any number of little things a merchant may overlook that are of great importance in the aggregate. It has been more than three years since a certain department store permitted any of its telephone operators to answer a call with a stereotyped "Hello." The common greeting of this store's phone people is "Good morning," or "Good afternoon." There is no real reason why the store's greeting over the telephone should be any different from the greeting accorded a customer by a clerk at one of the counters. The rules of the company requires that telephone calls be answered immediately, and the conversation must never be rushed.

Salespeople, as well as telephone operators, are likewise instructed with regard to the form and method of their greetings.

"Are you receiving attention?" is much better than the blunt query, "Waited on?" It is much better to say, "Can I interest you in shirts?" than "Something for you?"

There is also a decided difference between the words "want" and "wish." "What is it you want?" is far less polite than "What is it you wish?"

Retail Selling Schemes. Many department stores have found it possible to inaugurate various types of

service that have not entailed large expenditures and still yielded splendid returns. The manager of one furniture department keeps on hand a fairly complete list of houses and apartments for rent. This service has become widely known, and it has not only been appreciated but has added to the volume of the store's sale of furniture.

One successful idea is that of advertising to out-of-town purchasers that Mary Jones or Susan Smith or some other employee is engaged to do nothing but attend to the orders of the people who cannot come to the store and make their selections in person. One big establishment now has four young ladies, all answering to the name of Mary Jones, doing nothing else but making purchases for out-of-town customers. This same store has dressing-tables supplied with all kinds of toilet requisites, which are advertised as available for the use of women customers. The scheme has enlarged the sale of toilet articles.

The manager of this concern years ago organized a "baby club." A careful record is kept of all births in the city, and soon after a child is born, the parents are invited to register the infant in the club. If the father or mother does not wish to call at the store, a postal-card with the child's name answers the purpose, and this brings a pretentious-looking certificate of membership, as well as a little gold ring, for the infant. The rings are of good quality, but are purchased in such large lots that they do not constitute too great a burden of expense. In September of each year, the store conducts a baby contest, and prizes are given to the winners. The judges are selected from a list of prominent citizens who are in no way connected with the

management of the store. This attention to the babies of the town has not only brought the company much business, but has given the store a large amount of good will and publicity.

The successful sales manager must be a bit of a psychologist and statistician as well as a mere distributor of merchandise. He must know that oblong tables generally get customers farther into a store than do round tables; mirrors in convenient locations are much appreciated by the ladies and not altogether overlooked by the men.

A careful study of the records indicates that farmers buy more goods in the summer and fall than they do in the winter and spring. Like the majority of people, they spend most when the money is coming in. The idea that farmers are too busy during the summer months to do shopping is a mistaken belief. The roads are good for traveling in the summer, and this is an advantage that is not always present during the cold months.

In cases where stores have conducted special sales of goods for men much success has attended the plan of opening the store at seven-thirty in the morning for selling of goods in this department. Many men find it impossible to attend such a sale during the regular business hours.

Few things have paid better than the establishment of a follow-up, or courtesy, department. The chief of this section keeps in polite touch with patrons who have purchased certain kinds of goods or special forms of equipment, and makes sure that the articles sold are giving satisfaction.

Human nature is just the same in a town that ends

with "ville" or "burg" as in a great city that ends with "k" or "o." Small-town folks are just as appreciative of good service as the city people, and the merchant who is dead honest and keeps everlastingly on the watch for new ways to please his patrons will get his just reward, no matter in which of the forty-eight States he lives.

Retail Selling Plans of a Public Utility. The basic principles underlying retail selling were successfully and profitably demonstrated recently by one of the largest electrical companies in the country, doing business in Chicago. During the days of the war, the large central station companies furnishing electric current to our big cities were compelled to defer the further extension of their lines, and as a consequence were obliged to find some new way to enlarge the capacity of their business. The company referred to decided to increase their business by increasing the sale of electrical appliances, which apparatus would not only afford the company some profit in the merchandising transaction, but would add to the total current consumed. In this particular case the new plan afforded the company an additional rated capacity of 20,000 kilowatts, without incurring any additional capital expenditure for new equipment.

The company referred to decided that corporation "dignity" was more ornamental than profitable. The management started with the primary idea that the basic principles of retail salesmanship could be applied successfully in the field to which they were supposed to cater. Company employees were instructed that "real service consists in giving the customer what he wants, not what the company wants to give him." A system of merchandising was inaugurated, based on a careful

study of the psychology of the general run of customers. Experience had taught that the average person who is not technical is not at all interested in the fine point involved in the fact that a coffee percolator derives its energy from a lighting circuit, while a flash light derives its energy from a dry cell. Both of these articles are associated with things electrical, and a customer is annoyed if he enters a shop which advertises "everything electrical" and then fails to find a flash light among the articles that are sold. It was this kind of practical psychology that caused the Chicago people to add many articles of a non-electrical nature to the stock of merchandise sold in their electric shops.

Three Methods to Stimulate Sales. After careful planning the concern adopted a selling policy based on three methods of stimulating merchandise sales. First, was a premium plan; second, coupons; third, a system of deferred payments. As one manager stated, "It is only a few years since the idea of offering premiums with electric merchandise would have been regarded by large central station companies as nothing short of a criminal offence. We know that the premium idea is almost as old as the human race, but it appeals to a universal weakness—the desire to get something for nothing. The plan has enabled us to sell thousands of washing machines and vacuum cleaners that we could not have sold otherwise. Our customers like the scheme and that's the only practical answer worth while."

The coupon plan has largely increased the attendance in the electric shops, and has multiplied good will. The coupons are given to customers at the rate of one coupon for each five cents of merchandise purchased, and are redeemable in the electric stores for all kinds of mer-

chandise at the rate of 1000 coupons for each dollar of retail price. In six months the company put out 73,753,750 coupons in the city of Chicago. It has been found that the coupons give each purchaser the feeling that he is a part of the business equation and that the value of his patronage is recognized by the dealer.

Henry E. French, who was largely responsible for the establishment of this electrical merchandising plan in Chicago, says:

No form of advertising is more honest than that of premium giving, for it frankly admits as its original premise that it depends upon the desire of a man or woman to secure additional profit. Many concerns are able to cultivate the good will of the more important customers by giving them a discount for cash payment; however, the five- and ten-cent customer is just as valuable an asset, and with him, the small cash discount is not practical. A coupon for a fractional amount, however, does secure the same results, and gives the little fellow the same sense of satisfaction in his dealings with the merchant.

With coupons it has been found possible to introduce new articles to the public at a much lower cost than by the regular sales methods. The average conservative housewife will often read unmoved the account of a new household utensil for which she has to pay cash. But if she finds that the innovation can be hers, not for dollars and cents, but for coupons obtained through the judicious purchase of ordinary supplies, she is likely to try the experiment, and if pleased, will lead her friends along the same way.

In mechanics there is both "induced draft" and "forced draft." In order to get complete combustion we must either "induce" or "force" the surplus oxygen into the furnace. In pumping fluids long distances you can "induce" the flow much easier than you can "force" it. The pumps

are placed ahead of the product instead of behind. These pumps really do not release the load; they merely take the air so that the liquid comes forward of its own accord to fill the vacuum. The use of premiums corresponds to the "induced draft" that produces results which are obtainable in no other way. The profit-sharing coupon bridges the last gap between the merchant and his customer. It is advertising of a personal nature given at the time of the deal; it is an inducement for cash buying, minimizes debt, and promotes thrift; it encourages a customer to do the bulk of his buying at one store, thus increasing the size of the individual orders and reducing the cost of making the sale; it brings repeat business, thus reducing the heavy expense of securing new business.

One of the chief benefits of this energetic selling campaign in Chicago has been to create a material rise in the day-load of the central station through the wider distribution of current-consuming devices, which otherwise could not have been brought about except through carrying on a strenuous missionary and educational movement. It is also a definite fact that the good will of the company has been greatly increased by the publicity obtained through this merchandising scheme.

Concerning the third plan, that of "deferred payments," the results show conclusively that this service is also appreciated. In 1915, the sales in the electric shops were made on the following terms: 35 per cent. were deferred payment; 40 per cent. were charge purchases; 25 per cent. were for cash. In 1919, it is estimated that the sales were 47 per cent. deferred payment; 19 per cent. charge; and 34 per cent. cash. In this connection it is interesting to know that in the city of Chicago in 1918, 75 per cent. of all the pianos sold

were on the deferred payment plan, while in talking machines, 90 per cent. were sold in this same way.

In getting business, the Chicago people equipped a number of electric trucks for use in disposing of such bulky articles as washing machines and other heavy apparatus. The company engineers invented an ingenious carrying harness by which two men are able to take a sample machine from the truck into the prospective customer's home for an actual demonstration. This vigorous scheme of selling supplemented by the offer of an attractive floor lamp and silk shade as a premium, has resulted in bringing about record sales of washing machines and suction sweepers. The company has also taken into account the fact that seasonal sales offer an opportunity to increase the gross business. Electric fans are pushed during the warm months, while sick-room comforts are shoved to the fore in February and March. There is a special exploitation of certain electrical appliances that are suitable for gifts during the June wedding season and the Christmas holidays.

It is not likely that everyone will agree that the big central station companies are following a proper course when they enter actively into the sale of electrical appliances. However, it is difficult to deny that the greater the use of electricity in any community, the cheaper will be the price of current. The use of electricity also increases comfort and reduces labor, so let us look rather at the practical benefits derived and carry away the wish that all public utilities would try to solve their problems by increasing their gross business rather than by seeking a way out through a boost in prices.

Importance of Sales Letters. The work of the sales force in the field should be strongly backed up by letters,

circulars, and publication advertising. One of the chief weaknesses of most business letters is their forceless endings. Many of these letters have all their vigor and punch in the first paragraphs, while the last sentences, which contain the thoughts most likely to remain with the reader, lack in power and conviction. A second fault in the writing of business letters is the practice of putting all of the good arguments in the initial letter and saving nothing worth while for a follow-up. The first letter, no matter how well written, seldom turns the trick. When the letters that follow contain only weak arguments, the value of the initial talk is completely lost. When a number of products are handled by the same company, it is a good idea to use an illustrated letter-head showing an appropriate and striking picture in colors depicting in practical use the article which is the subject of the letter. These illustrated letter-heads are a fairly new idea that is proving successful. At any rate, the plan is quite an improvement on the old scheme of using a somber, stereotyped letter-head in an energetic campaign to get the attention of prospective customers. The best kind of a sales letter is one that actually tells true stories of what the particular product has really done. The most progressive companies now devote much time and labor to the work of accumulating data with reference to the performance of the products sold.

Advertising Campaigns. Advertising is an art which always seems to be new. Years ago a company felt that it had said a-plenty when its advertisement announced that the concern was the largest of its kind in the world. If the biggest company followed this plan to-day, it would soon descend from its proud position at

the top of the ladder. The up-to-the-minute ad-writer follows the plan of having his talk on paper carry the same thoughts that actually would be stated verbally if the customer was met on the street and engaged in conversation. Intensive advertising, or the exploitation of a single article, rather than a number, is proving more effective than advertising which covers a whole line of diversified products. General advertising is a splendid way to help a whole industry, but it is not the best way to advance the interests of a single concern. Some companies manage to scrape along through the benefits they derive from the general advertising of competitive concerns.

Every general campaign of advertising should be preceded by a scout investigation which provides the company with an early and complete analysis of the whole situation. Window displays should be shown in all the towns of a certain district at the same time that advertisements run in the local papers. All of the merchants who handle the particular article in question should be previously advised and afforded every possible coöperation. The ads go best when they are reinforced by letters and circulars.

One splendid form of advertisement is that which has a head-line asking a question. The psychology of this is that when the reader sees such an ad, it is ten to one that he will first answer the question automatically and then read down into the body of the advertisement to find and compare his own answer with that of the other fellow. One successful campaign of advertising was unique in that the company confined the text of its talks to calling attention to a number of local happenings entirely unrelated to the company or its goods.

Examples of unusual courtesy on the part of public employees or similar incidents of general community interest were played up in the advertisements, with the result that the public took notice of the ads from day to day, and the company received many compliments from appreciative and approving citizens. This type of advertisement draws attention which can later be capitalized. Many companies have found it a good plan to prepare a campaign in which the first advertisements carry human and interesting information concerning the company's plants and methods, then come ads telling of the corporation's ideals, after which appear talks which directly exploit the articles the concern produces.

Advertising Typography. It is often stated that the advertising pages of a modern periodical are the most interesting part of the publication. This is not difficult to understand when it is remembered that the majority of writers who prepare stories and editorials get from \$50 to \$100 a week, while the fellows who write the ads for our most important concerns get from \$10,000 up per year. The advertisement writer knows that his success depends, not on beautiful words or a perfect style, but on quickly attracting the reader's attention and then driving an important truth home in a minimum of time. The best ads have short words that startle rather than soothe, and that are eloquent chiefly in facts.

A certain advertising expert who handles several large accounts, and who recently put across a campaign for one of his clients that established a new record in the quantity of actual sales produced, has promulgated a set of "first principles" for advertisers that are well worth thinking about.

First, the advertiser should carefully study the class and habits of the readers of each paper that he intends to use. The editorial pages of the publication should be closely read and, if possible, the advertising copy should be made to harmonize with the general character of the editorials in the medium used. As a general rule, the editor of a paper is best informed as to the character and education of his readers. An ad that is addressed to corporation presidents or managers must be worded differently from one that is intended to reach foremen or one that is prepared for the minds of the whole people.

Careful investigations have shown that the statement which is to stand out most strikingly and be given the greatest emphasis in any advertisement should be located in the "optical center" of the page. Due to a strange illusion, this optical center is about 5 per cent. of the height of the page above the mathematical center. The second most prominent thought will be found most effective if placed three fourths of the distance from the top of the page, while the next best position is said to be a point three fourths of the page measuring from the bottom. The greatest trouble with most ads, especially those of amateurs, is the tendency of the writer to make his layout one-sided or top-heavy in appearance. Illustrations, and particularly type-matter, should not be too dissimilar in size and style.

Usually it is best to have the text matter set up by the printer in the type that you want to use in the finished ad, and then sketch in the cuts and decorations. This makes it easy to determine whether or not enough space has been allowed to tell the story. Experience

has shown that the space allowed for the text matter always seems to have shrunk after the cuts and borders are put in. If the writer is not careful, he will have to shorten his text matter or have it set up in smaller type, both of which remedies interfere with getting the message across and can be avoided by early care. While it is true that most readers first cast their eye over the emphasized parts of an advertisement, the fact should be borne in mind that the best ad is the one that is read from top to bottom. Hand-lettered layouts, when carefully spaced, often contrast so effectively with the surrounding printed matter on a magazine or newspaper page, that they draw a maximum of attention in proportion to the space they occupy.

Based on the foregoing, therefore, advertising should be prepared in accordance with several proved ideas: First, the artist must not be favored at the expense of the copy. The story must be set in type first and then the illustrations and borders built in and around it. When the reverse plan is followed too little space is allowed in which to tell the story. Second, interesting and easily understood copy must not be sacrificed for the doubtful benefits that are supposed to come when the ad is cut and hacked so as to make it brief and "peppy." A long, interesting message contains more selling force than a short, interesting one. Third, photographs pull better in ads than do drawings. The photograph makes the message appear real and sincere, for it tends to convey the thought that actual humans are using the product. Fourth, the language should not contain superfluous words nor be flowery. It should always be absolutely true and never "knock." Under no circumstances should the copy contain any-

thing that would be likely to start a controversy. No ads should be designed to scare the prospect into buying. "Fear" copy is poison copy that will never produce results that are permanently beneficial.

Color in Advertising. Advertisements printed in color have often increased the results two or three-fold over the same ads printed in black and white. However, in color work, care must be exercised in selecting the colors best adapted for the product advertised, for colors have powers of suggestion. The common thought seems to be that yellow is best in food advertising, which idea is probably based on the fact that when used in connection with such staples as butter, cream, and bread, this color has a "mouth-watering" quality. Red is used to secure effects of excitement, force, and warmth; green for restful, cool effects; blue and white combinations to suggest cleanliness and sanitariness, and solid, strong colors to suggest strength and dependableness. Uniform color combinations, running through all the advertising in any campaign, lend cumulative value to the ads and help greatly in immediately identifying each new advertisement with the product it describes.

If the business and the product are entirely legitimate, nothing is more destructive to a campaign than the admission of exaggerated statements into the copy. It is also true that the illustrations used in ads should show natural people who look and act very much as the average reader would look and act. The normal human model, although a bit more homely, will frequently fit better into the picture than the "dolled-up" beauty in a décolleté gown whom it is difficult to imagine as the operator of even an electrically-driven

washing machine. One woman who is up on feminine psychology suggests that when women look at advertisements illustrated with artificial, manicured mannequins, they say to themselves: "If this impossible French doll were to tuck up her clothes and actually use the device upon which she is leering, she would lose her frozen smile." The women in the ad should look like the woman who buys the goods.

Advertisements in trade journals are addressed to a trained class of specialists, so it has been found that the arguments advanced should be practically the same as those that have been found to bring results when used in salesmen's talks. In other words, trade-journal ads should pay close attention to the dollars-and-cents profit of the goods to the merchant, and not devote all of the space to boosting the qualities of the product. The primary interest of the merchant is in the profit-producing possibilities of the article advertised. In campaigns to reach the general public, it is a mistake to get up ads that are complicated. The average layman does not care to read an ad that looks as if the reading would entail labor. He is anxious to know just how he can reduce his household expenses or improve his health, but in general he does not want to wade through a column of statistics or try to master several paragraphs of details covering financial or economic conditions.

Benefits of Repetition. Repetition in advertising is the winning policy. Its benefits are cumulative. Practically all advertising is competitive, and the ad that forms the most effective and favorable contrast with surrounding ads will attract the most attention. One-line advertisements sprinkled generously throughout

the pages of a picked list of newspapers brought more orders for one large manufacturer of a staple than did large-space advertising, the cost of which was half again as much. In specialized advertising several large corporations have successfully followed the plan of devoting most of their space to telling what methods the firm uses to push jobber sales and to develop co-operation, rather than to talks about the company's products.

When getting up a booklet, catalogue, price list, or other piece of advertising matter that it is desired a prospect shall keep, it is advisable to try to put some kind of valuable information into the piece of advertising that will make it worth filing or at least keep it out of the waste basket. A little time and study given to the matter will enable the advertiser to prepare certain tables or an arrangement of uncommon facts that will make the advertising pamphlet or circular permanently useful.

Many advertising booklets are printed in such small type that the number of readers is reduced to 50 per cent. Most people mechanically pass up printed matter that looks as if it might tire their eyes. In this connection it is well to remember that the majority of folks read advertisements after they have done a full day's eye work. The glare from highly glazed paper makes the eye reject the matter printed upon it. Short lines should be used, for eye-fatigue is increased when the reader must make a long jump from the end of one line to the beginning of another spaced close beneath the first. The most satisfactory results have been obtained through the use of 12- or 14-point type.

Results have shown that a satisfactory kind of an

advertising booklet is one made up in accordance with the question and answer plan. This type of folder is well adapted for both wholesale and retail selling. The questions of course must be arranged from the buyer's point of view, and the answers should be brief and to the point. Mailing lists should be revised at least twice a year and this can be done through courteous wording and use of return postal cards.

Small dealers have a good opportunity at the present time to profit by the advertising of the big manufacturers who advertise nationally. Some dealers use these advertisements in circularizing customers and in store and window displays, thus making known the fact that they are local agents for some well-known product. Many of the big corporations, on their part, encourage the dealers who handle their goods to supplement the large companies' national advertising with local ads in the home papers. Knowing that newspaper advertising requires more study than the average dealer can give to it, several of the big concerns not only prepare advertising copy and supply cuts, but give expert advice to the little fellows who handle their goods.

A large amount of money and tons of paper are now wasted in haphazard circularizing. It is better to omit such a plan of selling altogether unless it is based on a careful preliminary analysis. One large company effected a 100 per cent. saving in circularizing by first collecting data on the ages of all of the firm's customers and then dividing these prospects into three classes. Almost every mailing list can be made to yield better returns in circularizing if it is first subjected to a critical examination, and then subdivided so that no part of the appeal is lost.

CHAPTER VII

BUSINESS METHODS AND IDEAS

Principles underlying Business Management—Personal Efficiency—Developing Brevity in Employees—Saving Time in Dictation—Paragraph Plan of Answering Letters—Color Codes—"Put-Up" System—Classifying Desk Material—Accounting Department Research—Graphics in Business—Value of Organization Charts—Practical Uses for Graphic Charts—Rules for Making Charts—Progressive Management—Illness as a Cause of Errors—Bonus for Accident Prevention—Sales Department Plans—Scientific Placing of Employees—Mechanical Aids to Business Efficiency—Courtesies to Customers—How One Chamber of Commerce Coöperates with Business Men—Granting Credit—Modern Use of the Telegraph in Business—How to Prepare and Send Telegrams—Telephone Manners and Methods—Ten Commandments for Telephone Usage—Fire Prevention—Fireproof Building Construction—Importance of Small Savings—Keeping Down Automobile Operating Costs—Wasteful Philanthropy.

Principles Underlying Business Management. The most efficient corporation is that which is most adept in the elimination of waste. In other words, if success depends upon efficiency, then the way to succeed is to persist in a single aim—the practice of economy in time, effort and material. Many executives can attribute much of their success to a strict adherence to a few simple rule-of-thumb methods. One president of a large corporation early in life formed the habit of making careful notes covering all ideas of an important nature occurring to him both during and after business hours. These notes were later dictated to his secretary, who classified them and prepared the way for the

development and execution of the thoughts. Much mental effort was thus saved by this plan of capturing stray ideas. Each day's work is scheduled as nearly as possible, and every endeavor is made to see that there is no departure from the program previously arranged.

Manufacturing and other costs may sometimes be materially reduced by increasing the rate of wages paid the employees. In one plant output has been increased 70 per cent, largely as a result of a 30 per cent. advance in wages. It should be made a definite part of the policy in all branches of a company's business to keep a careful survey of each employee and make frequent and accurate notes of the worker's gains, losses, virtues, and faults.

Where much of an executive's time is devoted to the everyday details of office and factory management, it is a good idea to employ frequently a trained investigator to go over the company's methods and make suggestions. The best plan is to call in a different man each time so as to derive the greatest benefit from a variety of experiences. In one instance where this plan was followed an expert caused the company to put in an automatic call system at several plants so that men could be located with a minimum of delay. Other suggestions led to the adoption of a plan of offering rewards to the workmen for worth-while ideas to improve the quality and quantity of the goods manufactured. This latter scheme brought to light a number of valuable thoughts that later were worked into practical inventions saving time and money for the company and bringing a reward to the ingenious workmen.

Years of experience in office and factory management

teach many lessons, but it is difficult to declare that any one particular scheme is absolutely correct in all cases, for two managers in charge of similar plants often gather opposite ideas from their business practice because of their differing viewpoints on business and life generally. Some managers believe in the efficacy of a time-clock; others are of the opinion that it is a better plan to institute a system which enables the company to keep a record of what each employee does, instead of how many hours he puts in. It has also been found that a majority of the individual failures have resulted from the employee's trying to get along without following a carefully arranged schedule for each day's work. Every day of each person's life should be planned. The real problem is to discover whether the individual can satisfactorily plan his or her own day. Greater success will come from the employee's fixing his own schedule than will result from a workman following an arbitrary routine laid down by the company.

Many so-called managers do only the work of a foreman. The latter is employed chiefly to do routine work in the nature of bossing others, while the manager is hired to be more than a boss—he is expected to turn out original ideas and plans. Too many managers are paid for holding down a job, whereas the amount of their salary should be determined by the quantity of work they turn out. It is unfortunate that up to the present time we have not been able to standardize mental processes in the same way as we have physical processes. However, it is now an accepted fact that a person is efficient only in proportion to how much and how fast he can think.

Time can be saved by reserving the best hours of

each business day for the hardest jobs. Efficiency experts state that a man's mind is at its best between eight and eleven in the morning. That is therefore the time during which should be scheduled the difficult thinking jobs of organizing, creating, and planning. It is also a good idea for an official to arrange his duties so as to alternate different kinds of tasks. Business studies have proved that it is often unwise to stick to one job until it is finished. Frequently the total time spent on a task can be shortened if the worker will leave it when he feels himself going stale on the job. At such a moment it is best to turn to a different kind of work, later returning to the first job and finishing it.

Perhaps no one thing causes greater waste on the part of executives than the practice of doing many little things that can be done just as well by a lower-priced employee. It is a good rule for an executive never to write a letter, sharpen a pencil, carry on a telephone conversation, or see a caller if anybody else in the office whose time is worth less can do it for him. Many a man with a splendid mind works at half-efficiency because he has not learned to dismiss worry and discontent from his thinking machine, even during the hours when he is engaged on his most important duties.

Time is conserved by an executive who has his secretary or stenographer lay on his desk each morning a schedule of appointments. One way to increase the value derived from an interview is to take notes during the conversation and later have these transcribed and properly filed. Those men who accomplish the greatest amount of work each day have become proficient in the art of allotting the minimum amount of time for each operation in the day's work and then striving to reduce

this minimum in actual practice. The best kind of schedule is that which assigns a certain time of each day to the performance of a special job. It is a good plan for an executive to have his subordinates understand that there are certain times of the day when he can be seen and other hours when he is absolutely unavailable. One way for an executive to prevent a disarrangement of his schedule by interviews is to figure out an approximate maximum of time that a caller should consume, and then keep that maximum in mind or on paper before him during the interview.

An effort should be made to train each employee to become a critic of his own work. One way to cause a worker to take pride in his accomplishments is to entrust him on certain occasions with special tasks requiring a sense of personal responsibility. This plan should be followed even with employees whose regular work is entirely mechanical. Considerable benefit is often derived from a policy of watching for special talents in employees. Whenever it is possible the worker should be given some kind of daily task in addition to his regular duties so that he will have an opportunity to spend a part of his time in working along the line in which he is most adept. Every person is encouraged when allowed to do something in which he can excel.

It is all very well to be cautious, but one should never forget that the power to decide promptly is a greater asset than ability to think exhaustively. The man who decides quickly will sometimes make mistakes, but he will learn more from his experience than the slow and timid man will ever learn from his days of thought. Prompt decision does not always mean snap judgment.

The floor plan of every office and factory should be so worked out that there will be no unnecessary walking on the part of employees. In nine out of ten offices and manufacturing establishments to-day, a rearrangement of furniture, partitions, and general equipment could be so effected that hundreds of feet of walking by workers each day could be eliminated. Useless and expensive traveling to and fro can be materially reduced by installing an intercommunicating telephone system. This also cuts down the frequency of office visits. The desks and departments that an executive consults most frequently should be located nearest to him.

Experience has taught that it is profitable for a company to provide an office with something akin to home comforts. Good light, plenty of heat, pure drinking water, and a well-equipped washroom have a dollars-and-cents value. It is a good plan to open doors and windows during the luncheon hour in winter as well as in summer. Better work has been found to result from a change in office air. Attractive workaday surroundings create a better attitude on the part of workmen and increase output.

Too little attention is generally paid to the arrangement of desks in a large office. Workers should not be so placed that they face each other or use the same desk. Both plans are distracting. Three or four feet of space should be allowed on all sides of each desk, and if possible the desks should be so placed that the workers will be back to back.

Cliques in an office tend to destroy team-work. For this reason it is wise to try to break up time-wasting, gossipy crowds. One way to do this is to separate the clannish workers by placing them in different parts

of the office or in different departments. Good-natured rivalry among the officers and departments in a company stimulates effort and heightens efficiency, but such competition must be carried on without the petty jealousies so common in large corporations to-day. The manager who can arouse rivalry of the right kind among his lesser officials is possessed of a faculty worth much to his company. It has been found that the quantity and quality of the work done has been improved by such office strategy. Much benefit has been derived from taking department managers out of a big office and giving them a small private room where they can work without annoyance. Among other suggestions one investigator recommended that a large electrically operated clock should be placed in one plant so that all of the clocks and watches in this establishment would be uniform and correct. Many minutes were thus saved by this simple maneuver.

Wherever possible, individual written instructions should be furnished to employees so as to standardize their work. A business library for employees should be established by every large company. If the concern employs more than two hundred people, it is often advisable to place an experienced librarian in charge. It has been found helpful to plan a reading course for workers. Each employee should be encouraged to study all of the periodicals that pertain to his particular line of work. Only in this way is it possible to discover what other men in the same industry are doing and saying. Practically every problem that comes up in business has been studied and overcome by someone else. It saves time to discover how others have solved perplexing questions rather than to devote time and

effort to working out original solutions for one's self. It is also a good plan to study other forms of business in other industries, because each and all are related in one way or another. The men who succeed in commercial life do not act on intuition or place their trust in guess or experiment, but use definite business facts of proved value.

A new and far-sighted policy is that of selecting two or three of the most promising workers every year or two and sending these men at company expense to some educational institution where they are trained in the technique of the industry served by the corporation. In return for the advantages bestowed upon them, the fortunate employees are expected to come back to the company after their course of study has been completed and continue in its service for a reasonable length of time.

A rather new idea is that of having a committee on savings. This body is composed of the most experienced financial experts in the company and its purpose is to give free advice to all employees in the matter of investing their money. An interesting rule is that no worker shall receive a promotion unless he has money in the bank or invested in securities. In the enforcement of this rule, due consideration is given to circumstances of an unfortunate nature that could not be controlled by the employee. The plan is designed to encourage thrift and care is taken to see that it works no injustice on a deserving person. Splendid results have come from the operation of a plan whereby the company secures from each worker who leaves its employ a frank statement giving his reasons for quitting. These letters from those who resign have furnished the

corporation with a large amount of constructive criticism, and have brought to light weak spots both in methods and personnel.

Personal Efficiency. Energy and ambition are splendid virtues, but they will not carry a man to the top unless he has original ideas of a practical nature and sufficient courage and initiative to transform his theories into actual working plans. The employee who would rise in his profession to-day must first decide on his objective and then concentrate all his energies on that one aim. He must also understand that the attainment of future success generally means the sacrifice of present comfort.

Any man who is reluctant or unwilling to learn new ways is an impediment to the progress of a business organization. Instances are on record where men have met with unlimited success in one field and yet have failed dismally in a new position simply because of their insistence on putting into practice the same business habits that had served them so well in their former jobs. In one case a man of high reputation and having an enviable record of accomplishment in a certain field was employed at a fancy salary by a corporation operating in another territory and catering to a different clientele. The second company barely saved itself from ruin by finally giving the new and highly advertised boss a substantial payment of several thousand dollars to cancel his contract and relinquish his job. His individual business methods had become so "fixed" in his nervous system that he found himself unable to change sufficiently to meet successfully the new situation.

This does not mean that all fixed habits are undesir-

able in our commercial life. Close attention to details, the practice of concentration, and the art of making definite and prompt decisions all become habits in a short time and add to one's chance of attaining success. Each workman must guide his response by the demands of the present day and he can only get ahead by adapting himself to change, growth, and progress. Still it must not be overlooked that when a good habit is automatized the faculties of the person are released for matters requiring careful thought. Fatigue is often lessened materially by an individual's habits which make his movements exact and properly timed.

The personal efficiency of any worker may best be gaged by finding out what percentage of available ideas the person actually adopts for practical use in his own work. The man who through reading or personal association comes across a dozen worth-while schemes and lacks sufficient energy to apply most of them to his own business is certainly not efficient.

Habit ceases to be a business virtue when it limits the output of an individual and prevents him from achieving his maximum accomplishment. Many men have discovered that they were doing only half as much as they could do because they had formed the habit of energizing at a low degree of intensity. Thousands of business men now attribute their breakdown in health to overwork when, as a matter of fact, their illness has come from a long struggle under a load of unphysiological habits. Habits of ease have always been more readily acquired than habits of work.

As a general rule, ability to save time is the most accurate gage of personal efficiency. One general manager has proved to be a past master in the art.

He permits no ideas worth keeping to slip away. Each important business thought that comes to him is jotted down on a small card and dropped into a desk drawer. At the end of the day the cards are gone over and the ideas that have been adopted and attended to are placed in the "inactive" file. Not more than ten or twelve cards with these daily reminders are permitted to accumulate in the desk drawer.

Developing Brevity in Employees. It is demanded that each employee shall develop conciseness and brevity in his work. Although not a fixed rule, it is generally understood by all employees that not more than 150 words shall be devoted to telling any story. The boss says that the tale of Creation was recited in less than five hundred words and most business problems can be explained in at least one fifth that many. Each worker is advised that he must know what he wants to say before he starts and that he must stick to his decisions after they are once made. This policy has tended to shorten greatly the average time of interviews between members of the organization. When a department head wants an office boy he simply lifts his telephone receiver twice. The operator at the automatic switchboard sees the signal and sends in a messenger. When a company official desires to send a telegram he lifts the receiver three times and the telephone girl rings for a telegraph messenger. With this plan no executive need interrupt his work or stop dictating to signal for an office boy or messenger, and his secretary need not be burdened with the task.

All conferences are held the first thing after arrival at the office each morning. This plan was initiated because the big boss found that when he attempted to

dispose of his mail the first thing in the morning he was embarrassed and delayed by many interruptions from under-officials. In the plan now used such conferences as are necessary are held at a time when everybody feels fresh. During the day notes are made for subjects to be discussed at the next conference the following morning.

Saving Time in Dictation. Considerable time is saved in the matter of dictation by making a careful memorandum of each detail that must be attended to before certain letters can be answered. All routine correspondence that requires no research is handled on the first reading. The other letters that cannot be replied to are laid to one side, and the memos respecting them are handed to the executive's secretary, who makes two copies of the list of notations. One copy goes to under-officials and department heads, who write brief replies to the questions asked. The other copy of the memos goes to the executive himself, who files it for reference. Later in the day, when the notations with answers appended have been returned to his desk, the boss is then ready to clean up the held-over mail, since he has notes before him containing all the information necessary to use in replying to his correspondents. All department heads are aware that answers to the queries of the chief must be made promptly.

Paragraph Plan of Answering Letters. Most business executives devote entirely too much time to answering letters. The paragraph system has proved to be a real time-saver in the handling of correspondence. Every man is human and is subject to varying moods. It is therefore impossible for anyone to write letters that are equally good every day in the week. When annoyances

are frequent our usual equilibrium is somewhat disturbed, and the letters we dictate at such a time are sure to reflect to a certain extent the humor we are in. Such periods of disturbed emotions are less hurtful to our business if we can prevent their reflection in our daily work.

With this thought in mind, many successful executives have compiled a paragraph book that covers most of the cases arising in any day's correspondence. In the construction of such a book a good plan is to have an extra carbon made of all the letters that are answered during a period of two or three weeks. At the end of such time all these carbon copies are classified under certain general headings, and then the letters are cut up into paragraphs and placed in separate piles. The best paragraphs, and those which will most commonly apply, are then picked out and revised in the most careful manner. These selected paragraphs are then pasted into a scrapbook that is carefully indexed. Paragraphs intended to start letters are placed on Page 1, while closing paragraphs are pasted on the last page of the book. In between are other pages of paragraphs that will answer practically every question that may be asked by a correspondent.

In this system the executive answers all letters by stating the number of the page and the number of the paragraph on the page. In this time-saving plan all letters that are to be answered are numbered. The dictator handles each letter as follows: "Letter Number 9. Start with Paragraph 3, Page 1; next, 2, Page 5; then 6, Page 9; and close with 5, Page 14." The numbered letters that have been answered are given to the typist, who gets the proper address from the letter itself.

After a month or two of working with this paragraph system an executive will become so well acquainted with the numbers of the paragraphs that are most commonly used that he will find it unnecessary in many instances to refer to his book, and this familiarity with the system will greatly facilitate the handling of each day's correspondence. An additional virtue of the plan is that all answers to letters will be of uniform excellence. None of the letters will reflect an ugly mood that the dictator happened to be in.

Most executives have discovered that the human mind is somewhat like a locomotive. It will travel along smoothly when there is nothing on the track to hinder or disturb its progress, but when it gets off the track the going is neither rapid nor smooth. It is for this reason that efficiency in attention to important matters, and especially in dictating, can be attained only when the work is done in a room where there is nothing to distract the worker's mind.

Color Codes. In one highly efficient organization color codes are used to simplify matters in all departments. The color red is used for items requiring prompt attention; blue is employed to record matters that are important but not pressing; black is used for all details that can be laid aside for future action. Most department heads keep memorandum cards on the mouth-piece of their telephones. These cards contain items scheduled for disposal the same day.

The chief keeps a progress sheet in his desk on which are recorded all matters pending and in course of completion. A color code is also used on this progress chart. Memos in red show at a glance all delays in the completion of any matter. In this way slow

spots in the company's organization can be readily detected.

One file on the manager's desk contains a card index listing every important employee in the company and giving a complete record of the worker's time of service, regularity in attendance, personal habits, progress in the company, principal qualifications, etc. These cards are kept up to date by writing additional information on them as new developments in the company occur.

The executive in charge of the company's purchasing department has installed a unique arrangement which he claims is a time-saver. He sits on an armless swivel chair in front of a large roll-top desk while directly behind him is a flat-top typewriter desk with disappearing machine. This arrangement permits him to get off short letters and memoranda himself without having to wait for a typist to come in response to his ring. Under the glass top covering part of the flat-top desk is a list of the telephone numbers most frequently called. Other data and tables most often referred to are visible under the glass on the desk. A spiral pen-rack offers quick selection of the pen needed for each special class of work. The chair intended for callers is placed in such a position that all papers, important or otherwise, are out of the range of casual eyes.

The system used by the company's executives for issuing instructions necessitates the employment of a loose-leaf book with sheets in duplicate. Instructions are written in this book and a carbon duplicate is sent to the employee who is expected to execute the orders. If the instructions cannot be carried out as indicated, a stub, attached to the duplicate, is filled in and returned to the executive issuing the order. If, on the other

hand, the orders have been taken care of, the upper portion of the duplicate sheet is signed by the employee and returned to the executive.

"Put-Up" System. The general manager has recently established what he calls a modified "put-up" system for the handling of important company mail that is not addressed directly to him but which eventually requires his action. The general plan is to have all letters that require special service and are not covered by routine procedure go first to some important subordinate whose business it is to see whether or not a letter can be taken care of without having to be "put up" to the general manager or other high executive. In case the letter must be referred to an officer higher up, the department head or other subordinate official figures out what he thinks would be the best way of dealing with the problem, makes a memorandum of his ideas in the matter and then notifies the information department, which acts as a clearing house for all "put up" letters. All of these communications are handled by a system and in due time the department worker is notified by the chief of the information bureau that the executive in question is ready to see him and complete the handling of the letter which he has passed up with comments attached.

The executive listens carefully to the solution proposed by the subordinate, and thus establishes a sympathetic personal contact. By the time the employee has finished his explanation the executive is ready to pass on the adequacy of the proposed solution. If the executive differs with the employee regarding the suggested course of action, a full explanation is made as to why he differs. The scheme so far has tended to bring

the company's personnel closer together and develop team-work. It has also been discovered that the plan saves time by referring many relatively unimportant problems to detail workers whose time is not so valuable as that of the higher-up executives.

In many business offices a system prevails which encourages subordinates to "pass the buck" on nearly all matters to someone in a higher position. Under such conditions, they are not inspired to formulate decisions, and when they are called in to furnish an executive with information, the hearing often results in an argument that does anything but foster harmony. The "put-up" plan makes real executives out of the big bosses and educates subordinates to undertake larger responsibilities, think intelligently, and develop initiative. It is also a fact that this scheme increases the worker's resourcefulness and causes him to consult the reference books in the company's library.

Classifying Desk Material. The desk of any company official is one fairly accurate indicator of the man's efficiency. Very little or nothing should be in the compartments of a desk that is not an every-day working tool. Many office men make the mistake of permitting their desks to be filled with subject matter that is referred to only every month or so and that hides data which must be consulted perhaps once or twice each day. So far as personal efficiency is concerned, there is little hope for those people who cling to the habit of accumulating data which are to be gone over and cleaned up to-morrow or next week. A small pile of unfinished matter soon becomes a large pile, and one large pile rapidly becomes the parent of a number of children.

No scheme for classifying desk material seems to excel the time-honored plan of dividing everything under four heads. First come unfinished letters and papers that are up for immediate consideration; second are matters held for future attention; third, letters and data that have been attended to and are ready for filing; and fourth come the desk equipment, writing materials, and other working tools.

Accounting Department Research. The accounting department of any company can be changed from an uninteresting archive of statistics to an essential part of the operating organization. An investigation recently conducted by the head of one accounting department developed figures showing in detail what it cost the company when an employee wrote a business letter. In this estimate was included the cost of folding a letter, putting a stamp on it, shaving phonograph records, filing, etc. Another plan produced a record that exposed inefficient work on the part of any employee. This record also provided information as to how authority was used and responsibility discharged.

This accounting department also found that the company's system of figuring such essential facts as cost and profits was unsatisfactory. Among the new principles laid down were the following: The percentage of profit should never be figured on the cost. Profit should come out of the selling price, not out of the cost. To find the cost percentage on sales, all of the year's expenses should be carefully totaled up and this figure divided by the total of sales. Freight should be made a production cost, and cash discounts should be included in administrative costs and not charged to sales.

Individual pay-roll sheets for each worker have been

found to save time and provide valuable information that could have been obtained in no other way. These individual pay-sheets show the year's total wages at a single glance and they may be made to serve as a "pedigree" of each workman, giving all needed information about him in condensed form. Since the present income-tax law requires each employer to notify the government of all employees receiving wages in excess of one thousand dollars, this job entails much work if the report must be compiled from the ordinary pay-roll sheets. When it is desired to make an analysis of the pay-roll by departments, this scheme makes the task easy, for the individual sheets may be grouped under department heads.

Graphics in Business. Throughout the world business is tending more and more toward the establishment of a universal language which will be intelligible to the people of all countries. Sheet music can be read and understood by musically educated persons no matter whether they live in America, England, China, or Africa. In like manner it is altogether probable that one day standardized graphic charts representing all phases of commercial and industrial endeavor will be as easily understood by intelligent people, even though they speak different languages and observe unlike customs.

Relative quantities and comparative results can be more readily grasped through optical means than in any other way. Well-made graphic charts present matters in vivid fashion and save the time of executives who must make decisions and initiate action. No one who conducts a business or manages men can remember complicated records of past performances, and yet, in nearly every phase of business, it is the results over a

period of months or years which form the real story. The prospective owner of a new house can grasp all the essential facts concerning his contemplated building by merely glancing at a blue-print, whereas an equally clear conception could never be conveyed by a written description.

Not more than a decade ago the use of graphic methods was confined almost entirely to men of technical training. To-day charts are used not only by business executives but by lawyers, physicians, and farmers. Guessing and hoping no longer have a place in the conduct of modern industry. The manager of the present time must not only know what his business is doing, but be able to predict with a moderate degree of precision what it is going to do. The use of charts is a sure and speedy way to substitute fact for surmise.

Data presented in the form of a column of figures are never as quickly understood as when the same facts are shown by a number of simple horizontal bars or by a single bar so divided up that each portion of its length or vertical height represents a separate and distinct fact. For example, let us assume that a certain corporation employs a large number of foreign-born workers and that of these employees the Slavs form 25 per cent., the Russians 20 per cent., the Germans 40 per cent., and the Italians 15 per cent. In such a case a much better idea of the relative size of the various elements is gained if the information is presented in the form of a small chart having four horizontal lines extending out from a vertical base. If we make the horizontal line representing the Slavs one inch long, the bar for the Russians would be four fifths of an inch, the German bar one and three fifths inches and the Ital-

ian bar would be only three fifths of an inch long. It may take a minute longer to present the thing graphically, but after it is shown in picture form, the facts of percentage assume a greater prominence, create a deeper impression, and require less mental effort on the part of the reader.

It cannot be denied that charts to some people are literally an abomination. A graph to such folks presents as many difficulties as would a page of manuscript written in Latin. Such opposition to the universal use of charts would be overcome quickly by an active campaign of education. It is easily possible to convince any reasonable individual that although the ultimate theory of charts is mathematical, the one who proposes to use them need only be given a few sheets of ruled paper and four fifths of the work is already done. The majority of charts can be easily understood by people who could not solve a simple problem in algebra. Consequently it is a fact that the idea of charts being complicated and uninteresting is an erroneous conception which we have permitted to take root and grow in the minds of many people.

Value of Organization Charts. One expert in industrial organization declares that it should be as irregular for an employee in any concern to be in doubt as to the person in authority over him as for a child to deny the parentage of his father. No corporation that is earnest in its desire for maximum operating efficiency can afford to conduct its affairs without the aid of an organization chart. Such an instrument eliminates irritation and conflict of authority, for where it is employed, each worker knows perfectly well to whom he must report. In companies where there is no proper

distribution of authority and responsibility, high-up executives frequently go over the heads of officers under them and issue orders to the rank and file of workers, thus weakening the authority of the foreman or department superintendent to whom the general run of employees are responsible and look for guidance.

Graphic charts are generally used to show component parts, make comparisons, set forth interdependent relationships, and reveal the relation of variable elements and quantities. Among the devices adapted to such uses are circles of different sizes, parallel bars, rectangles, squares, and pictured objects drawn on different scales. When pictured objects are used, much care must be taken with their construction or they may misrepresent the case. If it is desired to show the increase in the number of passengers carried by a certain railway system during a month or a year, it is considered best to indicate the improvement by drawing the required number of figures of the same size rather than to make the comparison by placing the figure of one large man by the side of a small one. In such a case each uniform figure of a man may represent any desired unit such as 1000, 10,000, or even 100,000 passengers. A rectangle can be used to show three different elements. If one side represents price and another side quantity, the entire area will stand for the value, or the quantity times the price. It must always be remembered that the relative sizes of spheres, circles, and cubes are not identical with the relative lengths of straight lines; and as a consequence the areas of these figures must be carefully calculated in order to insure accuracy of relationship.

The plotting of curves on backgrounds laid off in

blocks made by intersecting lines is the simplest and most efficient method of portraying the relation of variable quantities. In this method careful judgment is necessary in selecting the units on both the horizontal and the vertical lines. For instance, if the base line is made to represent time units, and too much space is allotted to each unit, the result will be a flattening out of the curve and a consequent minimizing of the changes which have occurred in the months or years that have passed. As a usual thing it is best to plot all curves on coördinate paper already ruled in squares or rectangles to suit the purpose in hand.

One retail shoe dealer who had discovered the effectiveness of graphic presentation became annoyed by the constant reiteration on the part of his customers that shoe prices were too high, so he decided to prepare a chart of the facts as he knew them to be, and at least prove that the large advances were not of his making. In carrying out the scheme, he used a rectangular chart with the prices of leather appearing at the left side of the rectangle, reading from the lowest at the bottom to the highest at the top. The base of the chart represented years, the most remote being at the left, and the most recent appearing at the extreme right. It took but a brief glance to see that while the price of leather had fluctuated for the first seven years, as indicated by the rise and fall of the curves, it had steadily increased for the last three years, the curve mounting without a drop. This condition was true of all four varieties of leather, each of which was represented by a curve. These curves were distinguished from each other by dots and dashes, explained by a legend placed in one corner of the chart. This graphic argument of the

shoe dealer was far more convincing than any verbal or written explanation could possibly have been.

Practical Uses for Graphic Charts. All firms that employ a large number of workers experience some difficulty in arranging summer vacations for their personnel, so that there shall always be a capable man or woman available to take charge of important work. One simple method of solving this problem is to prepare a time chart drawn on coördinate paper, ruled in squares, on which the months and weeks are indicated by divisions of the base line. The names of all employees appear at the extreme left of the chart. The vacation period of each worker is shown by darkening in the space representing the week or weeks assigned for him. In this way, it is not only easy for each employee to see plainly when his holiday is coming, but the company executives can readily discern which of their responsible workers are absent. This same kind of chart can be used in many other ways; by applying symbols, or employing colored pencils, it is possible to make such a sheet show other kinds of data, as bonus earned or lost, days absent, days worked, etc. Each horizontal line should represent an employee, and the days of the month are indicated on the base line.

Many large corporations employ a number of salesmen or maintain numerous branch sales offices. It is a common practice of such concerns to spur on the individual salesmen or branch managers, as the case may be, by publishing a weekly or monthly rating which lists each agent or office in the order of total sales made. The majority of companies find it best, in the operation of such a plan, to keep secret the standing of each person or unit. There is no better way to

present this kind of information than to use a chart made up of blocks arranged in columns equidistant from each other at the top of the sheet. Each little block should be half an inch long, one eighth of an inch wide, with ends pointed and blacked, leaving a blank space in the center of each block. If it is proposed to show the monthly standing of each of the company's salesmen, the usual plan is to assign each member of the selling organization a confidential number which is known only to the general sales manager and the chief officers of the concern. The standing of each member of the selling force is determined for the previous year. Instead of arranging the list by printing a column of names, this method calls for a column of blocks, each with a number written in it corresponding to the name of one salesman. The blocks in this first column, which, as stated, gives the rating for the past year, commence with the Number 1 at the top, and read downward, 2, 3, 4, etc., in regular order, to the man of lowest standing. At the end of January, the first month of the new year, another column of blocks is prepared, and in this case the man who was Number 7 in the rating for the previous year may have excelled all of the other salesmen and risen to first place. In such case, the first block in the January column is marked with the Number 7. The other blocks in the new column are likewise marked according to the most recent standing of the men. As new columns are added, lines are drawn connecting the ends of blocks having the same number. When a whole year's records have been completed, it is an easy matter to pick out any particular salesman's number, and by following the lines connecting the columns, it is readily evident whether

the man has bettered his position or fallen behind in his work.

Busy executives will find what is known as the "cumulative curve" a valuable aid in business, for the last point on the curve gives the total output since the beginning of the period for which the curve was plotted. The angle of the curve shows the rate of output for any period of time under consideration. A cumulative, or mass, curve never trends downward. Lack of output is indicated by a horizontal trend of the curve. Cumulative, or mass curves are particularly useful in the study of quantities in earth work, especially in road building or railroad construction.

Graphic charts known as "frequency curves" enable executives to study many industrial problems with greater rapidity and convenience than is possible by any other method. Frequency charts which are based on "the number of times a certain characteristic is found repeated in a large number of observations," have been used for many years to represent data relating to physics and biology, and it is only in recent years that the value of these charts has been recognized in the study of engineering and business problems. Frequency curves can be used effectively in such documents as annual reports of railroads, where they constitute a satisfactory substitute for tabulated statements, giving such data as the number of miles of different weights of rails in use at the end of any fiscal year. Frequency curves may be used to present problems such as the time required to answer telephone calls in different cities, and the like. Comparisons of wages are also clearly shown by these curves.

By means of careful designing of cards and plotting

of curves, the fiscal year of a business can be shown on a single 4 x 6-inch card. Willard C. Brinton, an authority on the use of graphic methods, says that one sewing-machine company uses a 4 x 6-inch card, and on this small area is able to show actual figures by months and quarters, leaving sufficient space for dates, inscription, and other lettering. On the left-hand side of the blocked area appears the vertical scale of earnings running from 0 to \$300,000, and progressing in multiples of \$30,000. The base line of the chart shows the months, and to insure absolute clearness, thirteen vertical lines are used so that at the beginning of each card the last month of the previous year can be repeated. It can readily be perceived that the record of several years can be examined in this concise form, and variations from year to year noted by arranging the cards in chronological order. A number of firms find it advantageous to plot their pay-rolls on 4 x 12-inch cards. Data for fifty-two weeks can be presented in this way.

The statisticians of some large corporations bind their charts in loose-leaf books. However, several of the leading students of graphic methods believe that loose cards possess an advantage over the loose-leaf system. They say that it is difficult in the case of the latter method to devise a system for keeping hundreds of curves in such a way that quick comparisons between any of them can be made. On the other hand, loose cards permit of instant comparison between different series of charts for a period of years, if desired. It should be emphasized that no system of curve records should be installed which does not permit of the quick comparison of any curve with any other curve in the whole system. Often an executive wishes to plan for

the future, and in such a case it is helpful if at one time he can have before him a curve showing the record of sales and another curve for the same period of time giving a record of the company's expenses. When sales increase, expenses per unit should decrease, and vice versa. When any other condition exists, the business is not on a sound basis.

It is a good idea, in preparing the graphic charts, to leave sufficient space at the left-hand side of the card for brief notations covering unusual conditions which have caused a marked rise or fall in the curves. It is undoubtedly true that after a couple of years have passed, the average individual is unable to remember the exact reasons for extreme fluctuations, even though at the time of the plotting they seemed unforgettable. The manager of a large telephone company was unable for some time to remember the reason for a drop in the curve of earnings of his concern two years previous. After much pondering and some search, he recalled a blizzard of ten days' duration, during which time the pay-station service was practically discontinued.

It is also a good practice to have each chart show on the left-hand edge of the sheet or card the initials of the executive authorizing it, with date of signing. It is always a good plan to fix responsibility for the authorization of a new curve, for some expense is involved in collecting data and plotting curves each week or every month.

Probably the most satisfactory scheme is to place one employee in charge of all curve plotting for the entire company. When this is done, it is easy for this particular person to be ready for the new year with titles and scales properly placed upon the new cards

that are to be used. At the proper time the new cards are handed to the various department heads, who have power to authorize the continuation of any curve for another year. The size of sheets, lettering of titles, etc., should be standardized as far as possible. The ruling on the cards or sheets should be so designed as to leave a margin of three fourths of an inch at the top and at the left, and one quarter of an inch at the bottom and right of each chart. Blue-printing is generally the most satisfactory and the cheapest method of obtaining copies of a chart. The ruled sheets should be translucent to permit of this. Some persons use onion-skin paper, either glazed or unglazed, but one well-known authority prefers a light-weight, high-grade bond paper, because it prints so well, stands erasure better, and does not crack with age. This same expert recommends olive-green ruling, as it is easier upon the eyes, especially in artificial light. When no blue-prints are necessary, different-colored inks, or water-color paints used in a drawing-pen, can be employed to distinguish one curve from another. In this latter method, the chart should contain an explanatory note or legend, stating, for example, that red represents gross earnings; blue, expenses; and green, net revenue.

In the making of charts from which blue-prints are to be produced, it is advisable to use black drawing-ink and to represent different elements or values by varying the lines in some such way as heavy solid, light solid, heavy broken, light broken, and combinations of dots and dashes. Of course, an explanatory key is necessary on each chart. Different scales may be used on the same chart. In using the typewriter to mark titles, tabulations, etc., on charts, a much clearer blue-print

is made possible if a piece of carbon paper is placed with the inked side next the back of the chart, so that a double printing is obtained.

When dealing with very large quantities, it is not always practicable to use a scale which starts at zero and is carried up by even steps to a figure representing the highest peak on the curve. Such a chart would either be too large for convenient handling or else the scale would have to be condensed so that only very large fluctuations would be indicated on the curve. In such a case, the best practice is to start the scale at zero and just above this point draw a wavy line across the sheet to indicate that the scale is broken. This line can be easily drawn with an ordinary serrated-edge ruler, as used by many accountants. The scale starts again on the upper side of the wavy line, at a figure a little lower than the lowest point on the curve, and is then carried up by even steps to a figure a little above the highest point to be shown on the curve. The efficient chart clerk will always endeavor to forestall questions regarding unusual points on curves by noting the reason for them on the chart before submitting it to his superior.

Rules for Making Charts. Not long ago some of our national engineering societies coöperated in establishing a Joint Committee on Standards for Graphic Presentation. This committee has already made many valuable suggestions which, although elementary, are fundamental in presenting business records in the form of charts. Here are a few rules worth noting: All charts should be arranged from left to right. Wherever possible, represent quantities by linear magnitudes, as areas or volumes are more likely to be misinterpreted.

in making a curve, the zero line should appear on the diagram, even if it is necessary to show a horizontal break in the chart. All zero, or base, lines should be drawn heavy so that they may be easily distinguished from other coördinate lines. It is advisable not to show any more coördinate lines than necessary to guide the eye in reading the diagram. The curve lines of a chart or diagram should be drawn heavy so as to be sharply distinguished from the ordinary line of ruling.

The horizontal scale for curves should read from left to right, and the vertical scale from bottom to top. It is usual to place the figures for the scales of a diagram at the left and at the bottom. It is often desirable to include in the diagram the numerical data or formulæ represented. If numerical data are not included in the chart, it is often desirable to give the information in tabular form alongside the diagram. All lettering and all figures on a diagram should be placed so as to be easily read from the base as the bottom, or from the right-hand edge of the diagram as the bottom. The title of a diagram should be made as clear and complete as possible. Subtitles or descriptions should be added if necessary to insure clearness.

Any executive who has not kept abreast of the development of graphic methods for keeping and presenting business facts should lose no time in investigating the value and convenience of such a system. A basis for chart work can be established by making diagrams covering the following important business factors: Dividends, profits, sales, material costs, manufacturing costs, elimination of waste, labor turnover, inventories, and accident causes. Such a series of charts permits a speedy analysis of any business, and gives more infor-

mation to stockholders or other interested parties than could be conveyed by a volume of words.

The inventory charts of a business, for instance, will show the manager the per cent. of certain kinds or grades of products on hand, as compared with similar goods in stock at the same season in previous years. Such information will probably indicate whether or not bargain sales or other forms of special attention must be given to certain lines of goods in order to dispose of the surplus on hand. Not long ago, the chief executive of one large corporation decided to visualize his business by means of a series of charts, and on looking them over, was astonished by the facts indicated in the chart covering labor turnover. An analysis showed that the company was spending upward of a hundred dollars breaking in each new man, and the chart showed that the turnover of the concern each year was nearly 500 per cent., causing an annual loss of more than \$50,000. An investigation followed, resulting in the discovery that the company's superintendent was working in collusion with an employment agency, which latter organization gave the superintendent a substantial commission on every man he employed.

The possibilities of graphic representation are unbounded, and the art is only in its infancy. Our government reports furnish us interesting and varied examples of the useful application of diagrams and charts in visualizing valuable records. The *Statistical Atlas* of the United States Bureau of the Census contains descriptions of devices both interesting and suggestive. Many of these devices are well adapted for use in the presentation of business facts. The bibliography of the subject is not extensive, but a number of

books have appeared, the study of which would well repay those interested in the science. The commercial and industrial methods of to-morrow will demand men who are speedy both in mental and physical action, and those executives who aspire to hold positions of responsibility will find themselves seriously handicapped if their education lacks a proper appreciation of the value of graphic methods for presenting facts.

Progressive Management. An investigation of the management methods of an internationally known corporation has yielded some interesting points that may be of use to those managers who are confronted with the task of readjusting an old-established business in conformity with modern ideas and practices. It is two years since a young manager was called in to bring the business referred to out of the rut into which it had fallen through conservative management of the old-fashioned type, and due solely to his wise and progressive management the company has entered upon what promises to be the biggest and most profitable year in its history.

A bonus system was established that took into account certain factors not generally recognized in such plans. A definite percentage of the net earnings of the company over and above the modest dividend requirements is set aside as a profit-sharing fund. One half of this fund is shared among the employees in proportion to the salaries they receive; the remainder of the money is divided among the workers in proportion to their years of service with the concern. The money is paid to the employees during the second week of each month, instead of having the workers wait six months or a year for their bonus. The plan has been extremely

successful in increasing the spirit of good-will throughout the company's plants. The idea was kept in mind that the value of any bonus scheme is greatly lessened by establishing a plan that causes the men to feel that the bonus is a benevolence instead of a definite reward for loyalty and efficient service.

When the new management took hold there was a serious shortage of skilled labor. This difficulty was overcome by a vigorous advertising campaign that truthfully set forth the more important advantages and opportunities of the work. Motion pictures were made and used wherever possible, showing the human-interest side of the business. Every effort was made to procure workers who lived in the immediate vicinity of the plants, so that daily fares for transportation would be eliminated as far as possible.

Selling methods were used, and these included showing the prospective employee through the plant, where the advantages of the work were pointed out. None of the advertising referred to age limits, the belief being that many men having self-respect and good character rather resent the implication that is implied in an ad which says "State age." Likewise, no employee was asked to state whether or not he was out of a job, the idea being that the fault of unemployment does not always rest with the man. Now that the campaign has been successful and a waiting list established, the company maintains a system of friendly follow-up letters keeping the prospect's interest alive to the opportunity that the company may present him at an early moment.

Each new employee is asked to devote from thirty minutes to an hour each day, on company time, to the

completion of a course of instruction designed to make the employee an efficient worker. Word was passed down from the new manager stating that in all cases employees must be considered before profits. A house organ keeps all workers closely informed concerning the progress of the company and the general status of both business and earnings.

For one hour each day the general manager's door is open to all employees who may wish to present constructive ideas or talk of their grievances. In the prevention of fatigue, rest periods have been introduced in those departments where the work is heavy and demands constant and close attention. In departments where the employees have sufficient respite rest periods are considered unnecessary.

One new plan just being started is a school for non-employees who are desirous of getting into this particular line of work. This school is to cater to the youths rather than to grown-ups, and is designed to build a force that may be drawn from when occasion rises. The plan is to start an employee at a wage below his ultimate possibility, so that he may grow and be encouraged by his advancement.

Much success has also attended an effort to induce employees to become stockholders in the business. The chief aim of this plan is to increase the workman's interest in his job and reduce labor turnover.

Illness as a Cause of Errors. An interesting experiment has been conducted to determine the cause of errors in the work of employees. All error slips are sent to a special investigator, who makes it his business to have a personal talk with the worker who is making frequent mistakes. The investigations so far made

appear to indicate that certain forms of illness are the most common causes of such errors. Where it seems advisable, the company's physician is given the record and becomes a factor in the case. He is expected to handle mental worries as well as physical ills, and all his recommendations are carefully considered and, if possible, favorably acted upon by the company.

The concern has adopted group insurance and has made a special effort to have it understood that the insurance is compensation for service, and not merely a scheme to hold the employee. The company's health service has more than paid for its upkeep by giving careful attention to the corporation's older employees. Each worker who reaches the age of fifty is now called to the physician's office and given first an examination and later health advice. The examination is never permitted to become the basis of discharge, but it does result in giving easier jobs to many who are serving in positions that entail too great labor. At the end of the first year of this service twenty-five per cent. of the old men examined showed an improvement in their general physical condition.

The closest kind of attention is given to the selection of foremen for all departments, since the foreman is the chief person among the company's executives that the worker comes in contact with. No matter how great an injustice is being done, workers are generally afraid to appeal to the man higher up, because of the retaliatory measures that the foreman may take.

It is the bullying foreman that has often caused workers to favor collective dealing in American plants. It is recognized, however, that in many plants the average workmen, especially those on a piece-work basis,

receive higher pay than the foremen who act as their bosses. It is not possible in such a case to develop enthusiasm or efficiency in the foremen employed. In overcoming this situation the company has taken pains to see that all foremen are given a rate of pay that is higher than that paid the men who work under them.

Bonus for Accident Prevention. A plan is being worked out in one plant whereby the foreman receives a bonus for accident reduction. In this scheme the accident rate is based on a careful study of past experience in the same plant. When the foreman equals this basic accident rate he receives a certain sum for each man under his supervision, and this bonus is increased in proportion to the results obtained in accident prevention. Not only does the plan cause the foreman to see that each worker is suited to his particular job, but it also encourages him to follow up the cases of the injured men in friendly fashion and see that they return to work as promptly as is possible. This plan has already shown a material decrease in minor accidents.

Having in mind the idea that workers of all classes serve with greater efficiency when they have no financial worries, the company takes advantage of the opportunity afforded by the weekly pay envelope to insert printed slips, personally addressed, giving advice and suggestions with respect to saving and investing money. The thrift and investment slips are prepared by the industrial relations department of the company, which same department acts in an advisory capacity to all employees who desire its aid in selecting, buying, and selling securities and in purchasing life insurance.

The pay envelopes also contain suggestion blanks, on which any employee may write down an idea intended

to shorten a method or improve a practice in some special operation. A special committee handles all these ideas, and those that are approved are turned over to the proper department for development. This same committee determines the kind and size of reward that is to be given to the worker for his suggestion. More than six hundred suggestions were received from employees last year, and nearly three hundred of the ideas submitted were adopted.

Every effort is made in all departments of the company to see that no employee wastes his or her time doing work that can be done by some other person receiving less pay. One suggestion that was printed and passed down from the manager to all department heads read as follows:

Many people are in the habit of saying that they can do a certain thing more quickly than they can tell someone else how to do it, and therefore many minor tasks are performed each day by various employees who could better devote their time to more important matters. Each worker should not forget that though he may be able to do a certain job once in less time that it would take for a first explanation, it is nevertheless true that after a subordinate is taught, the high-priced time of the more important executive is saved over and over again.

All the work of new or unskilled operatives is inspected after each operation. This tends to prevent large losses by pressing home to the unskilled worker that what he is doing is important enough to be given attention by those higher up. The same investigator always inspects the work of the same man, determines the causes of wastage, and works out a proper remedy.

Each workman is taught that his value to the plant increases according to the reduction in the amount of spoiled material that results from his efforts. Over the inspectors is an executive who devotes all his time to solving the problem of wastage in both offices and plants.

One of the first things the new management did was to issue a letter pointing out definitely and with force that no worker need fear that wages or prices would be cut through any increase in the company's output. The employees were told that underproduction was the only thing that would reduce prices in the company's plants, and that all workers who were deliberately keeping down their output through fear of a cut were following a plan that would be reflected unfavorably in their own pay envelope. In an effort to foster self-respect and increase individuality, not only heads of departments and foremen but even the rank and file of workers are given great freedom in their work. The thing that counts is results, and these are carefully recorded for each and every employee.

Sales Department Plans. Of all the company's departments, none was subjected to a more thorough house cleaning than the sales department. The new manager made it plain that it is impossible for the salesman to do efficient work while the thought of profit is uppermost in his mind. The salesmen were instructed to talk the customer's needs and not their firm's goods. The first move must be to discover and rouse the customer's self-interest; later it can be shown how the company's product can serve that self-interest.

Each salesman was instructed to establish a card index of all his prospects, filling in each card with

information gathered in the different calls covering the personality, peculiarities, fads, and so on, of the possible customer. The idea back of this plan is the possibility of a new salesman having to take over a certain territory, and without this kind of personal information he would be obliged to spend months in making a study of the prospects on whom he calls.

In addition to this thought it is the belief of the management that a card-index system assists the salesman's memory, furnishes him with conversation starters and good-will creators, and at the same time reduces the likelihood of his making mistakes. A well-filled card states the name of the man's school or college, his native town, fraternal organizations, recreation, political beliefs, and so on.

All the company's salesmen are requested to spend a large part of their time in cultivating new acquaintances and making friends among possible prospects. The thought is that acquaintance with the trade is just as profitable to the company as a salesman's knowledge of his line. The really efficient salesman devotes considerable effort to trying to determine just when each dealer upon whom he calls has the most time and is likely to be in the best humor. In addition to six conferences each year of all the corporation's selling force, the concern has established and maintains a company school, where all new men employed for the sales staff are required to attend and familiarize themselves with the corporation's policies, principles, and practices.

One rule of the company is never to permit any abuse of the cash-discount plan used by the concern. The management had undoubtedly learned from experience

that laxity in managing a corporation's cash-discount practice is certain eventually to defeat the very purpose for which the cash discount is offered. Never does the company allow a cash discount contrary to terms, and this being thoroughly understood by all customers, no enmities are caused by the strict enforcement of the scheme.

The greatest of care is taken in the preparation of collection letters. The first letter is sent out at the end of forty days, and other letters follow at ten-day intervals. No letter is ever mailed by the collection department that does not radiate friendliness. The letters are made personal and are not allowed to read like a routine dun. One of the highest paid and cleverest men in the company serves as the chief of the collection department.

The live-wire manager of this renovated company says the test of personal efficiency is not just in knowing the best ways to do things, but lies rather in the worker's ability actually to put into practice the knowledge he possesses. There is no dearth of worth-while ideas, but a real scarcity of people who have the energy and perseverance to do the things they know are right and best.

Scientific Placing of Employees. Many of the troubles and difficulties encountered with labor in the factory or office would be eliminated if only the value of psychology were realized to its fullest extent. Many large employers of labor, particularly the department stores, now put their prospective employees through various mental tests, under the guidance of vocational experts, to determine the particular niche in the organization into which the applicant would best fit. In

addition to tests to determine an applicant's mental alacrity, the physical characteristics of a prospective employee are also estimated and gaged so that he or she may be placed properly.

One well-known department store conducts a Department of Training, in which a part of every day is devoted to classes wherein employees are instructed in store system and all the intricacies of salesmanship. If an employee has any preference, she may learn to operate the comptometer, the dictaphone, and other mechanical devices common in large business houses. An Assistant Superintendent of Training makes it her duty to interest herself in each of the girls, both at the store and at their homes when it is so desired. It is this woman's duty, also, to listen to tales of woe, to advise in business and personal matters, and to render material help, even to advancing cash, in cases where the need is urgent.

New employees are sent to the head of the contingent force, a trained teacher upon whose shoulders rests the responsibility of properly placing each girl in the department for which she is best qualified. New employees are tried out in different departments during their time of contingent service. The different departments require different mental and physical types, and in spite of attempts made to classify applicants it oft-times happens that a girl is shifted through many branches of selling before she is placed permanently.

In one instance related by the employment manager of this store a girl who had been sent to his office because she appeared to be unsatisfactory frankly told him that she did find it hard to keep her stock in order, but that there wasn't a girl in the department who kept the

buttons, hooks, and eyes in better shape than herself. She saw to it that none of her stock was missing. The employment manager transferred her to a department where she had lots of sewing to do, and she "just loved to sew." The cloud in her young life had disappeared, for she no longer had to keep stock. Under the old way of doing things this girl most likely would have been discharged as incompetent.

Modern methods prove that each type of worker can be fitted to a task for which he or she is most naturally adapted. One girl may possess an active mind and yet be clumsy with her fingers. Such a girl should never be put to doing things that require manual dexterity. On the other hand, there are girls who are mentally slow, but very nimble with their fingers; such girls fail quickly in jobs that necessitate brisk thought. In other words, the mental and physical agility of the individual must be determined and the job fitted to the person, not the person to the job.

Mechanical Aids to Business Efficiency. In this day of modern labor-saving appliances, it is unnecessary as well as unwise to permit employees to put nervous energy and brain effort into tasks that could be done better, cheaper, and more speedily by dictating, duplicating, billing, and computing machines. Such devices pay for themselves in a remarkably short period of time.

Some of the country's greatest financial institutions are being converted into veritable machine shops where the bulk of each day's routine work is handled by mechanical devices that are more accurate than humans and possess the additional merit of being tireless. The modern establishments not only conserve the stenographers' time by having all dictation recorded on the

wax cylinders of business phonographs, and these cylinders later transferred to repeating machines which permit the typist to transcribe the notes, but they also employ shorthand machines on which the operator writes a phonetic English, which the same or another operator may transcribe later in the same way that shorthand notes taken by hand are translated.

The up-to-date typewriting machine is a wonderful mechanism, but when it is equipped with some of the many accessories now available it becomes nothing less than a mechanical marvel. One attachment will count the number of words the machine writes and this improvement is particularly valuable in departments where a great many telegrams are written. Another attachment is designed to hold the copy to be typed at the proper angle and height, while a metal ruler keeps the operator's eyes on the line that is being written. The so-called bookkeeping typewriters generally used for making out customers' statements add and prove all the figures that are written. Then there are the mechanical typewriters that are automatic and work on the same principle as that which is applied in the operation of a player piano. Like the records of a piano, those used in these automatic machines consist of rolls of paper perforated with holes. As a roll unwinds, the holes appear and establish electrical connections which cause the proper letters to be depressed with greater accuracy and as much speed as if the work were done by human fingers.

All of the big insurance companies and many of the large commercial establishments now use sorting and tabulating machines which separate and classify a miscellaneous assortment of data cards under proper head-

ings. By using one of these machines it is possible to set the device so that it will throw out the data cards of all men having blue eyes, all accounts sixty days overdue, all sales to any particular foreign country, or any other class of cards that contain a fact identical in nature. All of the cards are of the same size, and if they contain data such as that accumulated by insurance companies where the color of a man's hair, eyes, or complexion is a fact of importance for identification and research, the cards of all people possessing a similar characteristic have a hole in them at precisely the same point. The machine can be adjusted to sort out each card having a certain hole in it. These machines, like most mechanical devices used to save labor, are so constructed that if they make an error the machine locks automatically and remains useless until human hands correct the mistake and allow the device to go ahead with its work.

A number of our big banks not only save in time and effort through the use of telautographs, but they also eliminate the necessity of asking certain questions that may slightly embarrass their customers.

Large financial institutions that write a great number of dividend checks use special machines for this purpose. The dividend receivers are classified according to the number of shares they own. When the checks are to be written for all of the stockholders owning seventy shares of stock, the dial of the machine is set for the proper amount and this total is impressed into the fiber of the paper with indelible ink. For each different total of shares the amount of the dividend changes and the dial must be reset. Perforating machines are used to cancel all checks, stock certificates, etc., and these devices

are able to stamp the word "Paid" through two or three hundred checks at a time.

Large economies are effected through the use of addressing machines which save clerical hand-work in the mailing of circulars and statements, and cutting machines which prepare small metal plates with customers' names stenciled on them for use in the addressing machines. Other devices seal letters and place postage stamps on the envelope. Melting pots heated by electricity keep sealing wax ready for instant use. Electric letter openers cut less than the hundredth part of an inch off three sides of each envelope and this work is done with such minute precision that the contents of a letter are never injured. Machines are now in use for endorsing checks and these devices will do more work of this kind in a day than could be accomplished by half a dozen men. One of the most unique machines yet designed for commercial use is a device that will sign a dozen letters or other documents simultaneously by means of fountain pens controlled by a master pen in the hand of the signer. The letters or papers to be signed are automatically carried under the pens as fast as the signatures can be attached. Well-equipped cashiers' desks now have machines that automatically produce the exact change that is due the customer. With one hand the cashier simply pushes the proper key on the machine and with his other hand he catches the change that must be handed the patron.

Many companies have now equipped their telephones with an apparatus which enables the person talking to continue using both of his hands. This is of considerable value as a time-saver, especially in the case of calls where the line must be held either before or af-

ter getting the proper connection. Some of the large offices now have a double arrangement of central switchboards, one for inside and the other for outside calls. Any employee having a telephone on his desk presses one button when he wishes to talk with another employee of his company, and a different button if he desires an outside number.

A majority of the big banks and trust companies now have what they call a "cremation" department where specially constructed incinerators are used to burn all cancelled bonds, coupons, etc. The furnaces are equipped with a very fine grating to prevent even the smallest particles from escaping, and electric blowers stimulate the fire and force the burning. Another department now rendering valuable service to large corporations is a photographic division where photostatic machines save the time and effort of typists by photographing reports, contracts, wills, checks, and all kinds of important documents. All such photos are developed and printed right in the same department and the prints are dried by electricity in a minimum of time. Many companies have found their photostatic department particularly helpful in getting together a large mass of data for use as an exhibit or as evidence in lawsuits.

Some offices are now using electrically driven mimeograph and multigraph machines, and devices for testing the quality and resistance of paper to furnish data that will be of help to the purchasing department. Perforating and punching machines as well as those for cutting paper are quite common, while a compact mechanical arrangement is now installed in some of the largest offices to do bookbinding in the most modern fashion.

Many corporation executives now prefer to have all of their company's important papers and records kept in book form rather than laid away in many files.

Courtesies to Customers. In all branches of a business and particularly in the retail end where employees come into contact with the public, service should be the basis of all action. Certain suburban stores located on busy transfer corners render a degree of accommodation to patrons that is quite unusual. Printed schedules are posted showing the time of arrival and departure of various cars on the electric trolleys passing this point in the city. It is the business of one employee in these stores to announce a short while beforehand what cars are due to come and leave. This permits the customer to shop up to the last moment without being subjected to the inconvenience of missing the car she wishes to take.

Some of these suburban stores have a bulletin board on which are posted all telephone calls received for customers. Confidential messages are received and held in a sealed envelope. As a general rule the name of the person called is posted on a bulletin board and upon inquiry he or she is given the number to call up, providing there is no message to deliver.

One corporation with a chain of retail stores endeavors to keep in touch with all its customers by sending an original letter to each patron who has not made a purchase within the last six months. The letters sent out are signed personally by the local manager and state that the company has noted the customer's absence with much regret. A simple but efficient card ledger provides the company with information as to when a customer made his last purchase.

In all of the company's stores each customer is card indexed as to the number and kind of purchases made. By this plan, the local manager is enabled to send each customer booklets and other literature on only those subjects that will be of interest. This information is collected by one clerk who takes the monthly statements and posts each customer's card with the last month's purchases, subdividing the articles under their proper headings. In this way the company not only gets a clear idea of the likes and dislikes of each patron, but it also obtains definite information with respect to each person's social and financial standing. Through the operation of this plan there is no danger of wasting a circular describing roller-skates on an old bachelor who has difficulty navigating with a cane. All advertising matter is sent out with statements and receipts and is never included in the letters mailed to absentee customers urging a renewal of their patronage.

How One Chamber of Commerce Coöperates with Business Men. A splendid example of the value of coöperation in business is afforded by the chamber of commerce of a rapidly growing city of our great Northwest. Some of the plans and methods of awakening buying interest on the part of the community which are employed by this progressive board of trade are so unique and depart so markedly from tradition and established custom that they promise to set up new standards of coöperation that will be more in keeping with the spirit of the times.

When you get within several hours' ride of this particularly thriving community, well placed billboards commence to tell you something of the history of the city and of its advantages. This advertising campaign

was put through by persuading the important business men of the town to erect billboards at advantageous points, one third of the space stating the name of the concern owning the board, and the remaining two thirds being devoted to an advertisement of the city. All of the boards are uniform in style, and carry the name of the city in large letters at the top. More than fifty of these billboards have already been erected, and no two of them feature the same talking points. Any traveler that gets into the town is sure to know something about its virtues unless he has been asleep on the train or traveled with the shades of his car-windows down.

Aside from this billboard advertising, the Chamber of Commerce and all of the advertising clubs in the city indulge in the liberal use of printer's ink in the magazines and newspapers of the country. Some of the ads are designed to bring in new manufacturing establishments while others are intended solely to boost the city's population. The results can best be judged by the fact that forty-two new industries have been located in the town during the last ten months and more than four hundred new families have located there in the same period of time. The advertising committee of the Chamber of Commerce has induced the business men of the town to place catchy slogans on all of their letter-heads and envelopes used in daily correspondence. All the slogans were supplied by the publicity committee of the chamber. Some of them tell of the climate, others give facts concerning transportation facilities, and still others point out the cheapness of manufacturing sites, the magnitude of nearby markets, etc. New slogans are provided for new batches of stationery. A

scheme is on foot to defray the cost of community advertising by apportioning to each business concern a definite share of the expense, based on the profits of the individual companies. It is not proposed, and, of course, is not possible, to make the contributions compulsory.

The research department of the chamber has been successful in originating schemes to benefit the local trade of the city's merchants. One day of every month is known as "Free-Mileage Day," and on this particular date the merchants allow a rebate to each suburban customer, equal to the round-trip fare, at the rate of three cents a mile, from the patron's home town to the city. In this plan it is recognized that the suburban customer will probably make purchases in a number of stores, and it is specified that the rebate shall be paid to him by an authorized clerk at the Chamber of Commerce when he shows that his receipts for collective purchases amount to more than ten dollars. This plan of having the rebates dispensed through a single clearing-house simplifies the matter, for it is easy later to pro-rate the fares among the different merchants according to each concern's total sales. This monthly event is widely advertised, both by circulars sent to a large mailing list and by announcements run in the newspapers of nearby towns. All of the publicity is put out by the Chamber of Commerce itself, and the cost is taken care of by a retail merchants' section of the Chamber.

The advisory committee of the research bureau makes frequent suggestions to the members of the Chamber, as a result of the many detailed investigations carried on. For instance, one letter pointed out the superior

value of slogans, as compared with trademarks. Trade slogans stick in the memory, while trademarks are soon forgotten. Another letter called attention to the importance of truth in advertising, and discouraged the use of misleading names on articles that are only imitations of the real thing. It was further stated that ads telling of extraordinary reductions in the prices of staple goods create an undesirable impression in the mind of the customer. It is altogether probable that when the advertisement shows a wide difference between the original selling price of an article and the marked-down price, the patron will conclude that the merchant has been making an exorbitant profit. Either this thought must arise, or the purchaser decides that the claims made in the ad are false.

Two classes of retailers were persuaded that it was to their advantage to adopt a uniform store design. Supplementing this scheme of having a similar exterior and interior decorating design, all of the stores in each of the two lines pledged themselves to observe certain high standards of business practice, and the result is that the customers of any and all of these merchants know exactly what to expect in quality and service when they enter one of the stores of standard design. This plan follows out the idea capitalized by some of the large corporations which operate chains of stores throughout the country. It should be stated in connection with this plan that the merchants in each particular line have their own special design and do not conflict in color scheme or other decorative feature.

One of the principles played up largely by the Chamber of Commerce is that service is the chief essential, and that it will infallibly be followed by

legitimate profits. Just one example will indicate how this thought is applied in every-day practice. All the hotels in the city now have special information bureaus or, in the case of the smaller establishments, well-informed clerks whose duty it is to furnish motorists with all kinds of information concerning roads, routes, and garages throughout the region. No pains are spared to impress upon the mind of the automobilist passing through the town the fact that he is in a community where the common virtue is a generous and far-sighted spirit of coöperation.

The Chamber collects all kinds of information from nearby towns, and furnishes the facts to its local members. The information circulars that are mailed out at regular intervals tell of newly married couples, recently constructed dwellings, and office buildings and the names of occupants, business indexes, or trade barometers are frequently included, and whenever it is possible, the Chamber furnishes advance information concerning the trend of raw materials or other like important industrial factors. A special service is conducted to expose crooked promoters and all dishonest schemers who may likely prey upon the business men of the community.

Other reports furnished by this progressive Chamber of Commerce cover the cost of delivering packages throughout the city and the surrounding territory, the advantages and disadvantages of cash and credit systems, the practicability and possible profits of the self-service merchandising plan, and the development of schemes to attract customers and increase sales.

It was shown that the average delivery charge of all the important stores in the city was a little more than

15 cents per package. The lowest charge per package for delivery was 6 cents and the highest charge for any individual concern was 38 cents per package. The investigation with respect to the relative merits of the cash and credit systems indicated that as a general rule the credit plan encourages sales. Most customers prefer to pay monthly, for in this plan it is easy to keep track of their expenditures. Most purchasers are unwilling to wait at home for goods that are to be delivered, and they are usually offended if the goods are brought back to the store when no one is at the house to receive them. Experience has shown that charge customers generally buy what appeals to them and give less thought to the prices of the articles than do the patrons of cash stores.

The self-service plan is reported to work best when all of the goods are displayed on shelves or tables and the prices plainly marked on the articles so that the customers may help themselves. An ideal plan is to arrange the store so that the customer enters each department through a turnstile, picking up a basket on the way in. After the buyer selects his merchandise, he leaves the department through another turnstile, and a checker who is sitting there removes the goods from the basket and quickly calculates the total amount of the purchases, mentally or on an adding machine. It is estimated that one checker and one cashier can handle from 1000 to 1200 people in a store of this kind daily. It is possible in such an establishment to include a delivery system by stipulating an additional charge of ten or twelve cents for the delivery of each batch of goods purchased.

Many ways are indicated for attracting customers

both new and old. Practically all of the plans are based on the single idea of rendering the patron some unusual service. This thought is exemplified in the schemes suggested for selling phonograph records. Several merchants have met with success in the rather novel method of selling records by means of a demonstration over the telephone. In order that the customer may hear the record plainly, the salesman uses a megaphone attachment. Each day one or more of the clerks in the phonograph department call up certain customers and talk of the new records that have recently come in, and if they find the customer friendly to the idea, several of the records are played over the phone. One merchant greatly increased his sales of records by adopting the plan of encouraging customers to come in and try the records themselves. A big department store has made a hit with mothers who are obliged to bring their children with them when shopping, by establishing a children's phonograph room where the youngsters are entertained by appropriate selections when the parent is busy making purchases in some other part of the store. Incidentally it may be stated that in following this plan the merchants have been able to sell large numbers of records to the children who had heard them and had become interested in certain of the selections.

It goes without saying that there are a lot of things this particular Chamber of Commerce has failed to do in its extremely energetic campaign to help its local business men and build up the trade of the community but the fact remains that the merchants of the city in question have a stronger and more helpful ally in an organization of this broad-minded character than have the members of most of our American chambers of commerce.

This may all seem a bit far-fetched to the business conservative who is strong for the assertion of strict individualism, but the proof of the pudding lies in results, and a prosperous and satisfied community furnishes an argument in favor of this type of mild parentalism and community coöperation that is difficult to overcome. It would cost a good deal of money for the individual merchant to secure all of the information that is now easily collected by the organized research department of his Chamber of Commerce.

Granting Credit. The granting of credit is one of the most important factors in creating a bond of good will between a house and its customers. Credit is a service to be sold just the same as are other features offered by a concern. More accounts can be lost by improper credit methods than can ever be restored by any sales campaign. One interesting policy is that of interchanging the credit manager and the sales manager for several weeks each year. This plan provides the credit man with a better outlook on the problems of the sales department while the manager of sales learns of some of the difficulties encountered by the company's credit service. One result of this kind of coöperation is the assistance the sales department is asked to give the credit forces in the writing of collection letters. Letters designed to bring in money from slow-pay customers must contain something in the nature of a smile and be human in the extreme. While the majority of credit managers possess ability to read a dealer's character from his letters and can often picture not only the man's personal appearance but his store from such correspondence, they should accept every opportunity to make personal visits and get in closer touch with their trade.

While many companies have profited largely from the plan of requiring each customer to submit a signed financial statement the first of every year, no attempt should be made to pursue an arbitrary course that would likely offend or alienate prospective buyers. No slow-pay customer should be dropped until every effort has been made by the credit manager to educate the man to understand that goods are sold on definite terms and payments are expected when due.

Much success has attended a program of education designed to force home the real meaning of "2 per cent. ten days." Customers have been told that this 2 per cent. discount is really a bonus given the buyer for paying his bill 20 days sooner than his purchase contract makes necessary under the "30 days net" clause. The big point of the argument is taken up with showing that this 2 per cent. for 20 days amounts to 3 per cent. a month, or 36 per cent. a year. No wise business man to-day can afford to ignore this saving of 36 per cent. a year on the total amount of his average monthly purchases. Aside from the dollars gained, the buyer benefits materially from his improved credit standing. Most merchants would be far ahead of the game even if they borrowed money at 8 or 10 per cent. and took advantage of the cash discount offered them by manufacturers.

A good practice to follow in the matter of credits is to find out who is responsible for the payments of bills and concentrate all attention on that individual, carefully studying his methods and peculiarities and his company's policy in the matter of making payments. Too much confidence should not be reposed in financial statements; circumstances and conditions may modify

their value as an index of the customer's financial condition. Credit must be based on character and business ability as well as on capital. One customer may have less money than another and yet may possess experience and energy that will make him a far safer proposition during a time of unforeseen business difficulties. Some merchants have plenty of assets but are negligent in such matters as providing sufficient insurance and forcing a frequent turnover of their stock to prevent excessive depreciation.

Credit men must act as a check upon both customer and salesman who are inclined to encourage extravagant buying. It is bad business at any time to overload a customer and particularly so at a time when market conditions are unsettled and the trend of future prices uncertain. Credit departments should never destroy the envelope that contains the statement sent in by a customer. Should an unknown buyer attempt to practice fraud, the envelope showing the date of the post-office cancellation stamp will come in handy in court proceedings. The credit department should always work in advance compiling information about prospective customers. It is a good rule to remember that the debt limit has been reached when liabilities amount to fifty per cent. of the buyer's quick assets.

Though it should always be a company's policy to bind its salesmen through just treatment and liberal compensation, there should nevertheless be a plan in force to prevent a salesman from appropriating the trade which he has built up at the expense of the corporation. It is common for a salesman to carry the accounts in his territory to a competitive firm with whom he has become affiliated. To overcome this

possibility an executive in the home office should be made responsible for a given number of accounts. When a salesman lines up a new customer it should be the duty of this office man to take an active part in selling the service of the house to the new buyer. In doing this he acknowledges the order and writes the notice of shipment. The office man should also make frequent trips through the territory in which he is interested, sometimes with and often without the salesman who covers that section. In furthering this scheme it will be found advisable to change a salesman from one territory to another. The whole plan provides a good insurance against the losses that would otherwise result should an aggressive competitor enter on a campaign to secure the service of a company's experienced salesmen.

Modern Use of the Telegraph in Business. We are in an age when most businesses are operated under forced draft, and speed is a prime virtue. We are also more analytical than we used to be, and we have found that a letter has more elements of expense connected with it than we once supposed. The paper and envelope cost something, and the postage stamp increases the total somewhat. Then there is the typing, the wear and tear of the machine, the ribbon, the ink, etc., all of which add their share to the final expenditure. This point of view is causing many business men to follow the plan of using the telegraph and telephone in ways and for purposes that were unheard of only a few years ago.

The wire message has a punch that the letter lacks. It is also a fact that when a man arrives at his desk in the morning, he will generally find his telegrams lying on top of his mail. The element of priority is not

common to other forms of communication. One efficiency expert figured that in his firm, where the telegraph was used only for emergency purposes, and the mail was employed to serve as the principal means of correspondence, the company lost the benefit of one hundred additional business days each year. When a letter is mailed, the transaction to which it relates dies until the letter reaches its destination; the same transaction dies again while the answer is traveling back by mail. These dead periods are of course a total loss, and in many cases might be avoided by using the telegraph.

But the saving of time is not the only benefit of wire communication. The telegraphic message gets results because more importance is attached to it. The average telegram does not filter through a whole organization, and is not handled by one clerk after another. Generally the message goes direct to the right man and compels his immediate attention.

Perhaps the greatest advance in the use of the telegraph is its utilization as a selling medium. Two large concerns in Chicago were in competition for business in a far Western State. One used the telegraph and had closed most of its contracts before its competitor's letter had gotten out of Illinois. This winning concern is the same company that requires each of its fifty or more salesmen on the road to send a daily report to the head office in Chicago by day letter. Every morning, each salesman receives a reply giving him market changes, instructions, and an occasional pat on the back to encourage him in his work. It helps a lot when the fellow traveling, and out of touch with headquarters, knows that his performance is followed from day to day.

As to the cost of making sales by telegraph, this, of course, varies with the product sold and the skill displayed by the salesman in wording his message. One shoe manufacturer in New England, wishing to clean out a stock of slippers, sent two hundred and fifty telegrams, costing \$160, and disposed of the goods at a selling expense of only one per cent. A large company in Baltimore invested \$30 in night letters and disposed of \$6000 worth of olive oil at a selling cost of $\frac{1}{2}$ per cent. A Philadelphia drug house spent \$3000 on a telegraphic campaign extending over several days and found the result so satisfactory that the plan was adopted as a periodic feature. An Illinois manufacturer sent one hundred telegrams, netting forty-six answers, out of which there resulted thirty-two orders. The average expense of each order was eighty-eight cents, comparing with a cost of \$5 for each such order secured by methods used in the past.

Down in Oklahoma, a small town was in need of a pumping equipment. A number of manufacturers were hot after the business. One of the concerns wired several cities where their products were in operation, asking them to send a day letter to the town board in Oklahoma, at the company's expense, stating whether the engines had given satisfaction, and whether the concern was wholly reliable. Twelve telegrams were received by the board the next day and the enterprising manufacturer landed the contract. An unusual use of the telegraph was made by a company that was unfortunate enough to get in straitened circumstances owing to slow collections. This corporation was on the verge of making an assignment when, in desperation, the management decided to try a file of night letters as a last

resort, in an effort to scare up some business. Fifty such telegrams were sent to possible customers and these brought in orders amounting to \$6000, which were hypothecated at a bank, enabling the company to obtain sufficient funds for immediate needs and thus secure a new lease of life.

One of the most effective uses of the telegraph is for the purpose of collecting difficult accounts. Because of the importance attached to a telegram, slow-pay customers will heed such a message requesting money, when a collection letter would be thrown in the waste basket. There is a forcefulness and urgency about the telegraphed communication that impels immediate action. One company in Tennessee decided to use the telegraph on parties where every possible method had been exhausted in attempts to get a reply. Wired messages immediately brought letters promising settlement on specified dates, and there were checks to settle accounts that dated back two to three years. An up-to-date company in Cincinnati handles all delinquent accounts by mail correspondence up to a certain period, and when this proves unavailing, the telegraph is employed. This latter method results in the prompt collection of two thirds of the cases.

An original if not unique use of the telegraph was made recently by a Pacific Coast hotel. This hostelry sent one hundred night letters to prospective out-of-town visitors to an annual convention that was to be held, soliciting their patronage. As an added inducement, the management inserted in the message: "This telegram good for your taxi fare from depot or dock to hotel." As a result of telegrams costing \$26, there were sixty reservations. One reservation alone,

covering a party of eight, more than paid for all the wires that were sent. Quite a few of the telegrams were turned in by the taxi drivers.

A project of some magnitude was carried out by a large Philadelphia department store not so long ago. The establishment had been considerably altered, and just prior to the opening of the enlarged store the merchant arranged for the transmission of 33,000 night letters inviting possible customers to attend the opening. The response was so satisfactory that the store was crowded the entire week. The messages cost the concern \$6000 or \$7000 but the returns more than justified the expense incurred.

How to Prepare and Send Telegrams. Several fundamental principles should govern the preparation and sending of telegrams. All messages, if typed, should be double-spaced regardless of length. Code words should be written in capital letters. Punctuation marks, unless paid for, are not transmitted, and it is important therefore that telegrams should be so phrased that their exact meaning is not dependent on such marks. Always write out numerals, not only to avoid error, but in many cases to reduce the cost. A date when spelled out will often make but one word, while if figures are used it will frequently run two to three words. Do not use contractions such as "can't" and "won't." This endangers accuracy. Spell out the words East, West North and South, and omit such affixes as st, nd, and th. For example: 36 W. 40th Street is preferably written Thirty-six West Fortieth Street. A careful, and complete street address facilitates delivery, and no charge is made for words in addresses.

If a message is not to bear a signature, there should

be written in place of the signature the words "Not Signed." It is also advisable for the sender to write his local street address and telephone number at the bottom of the blank. He should indicate the class of service desired, and in the lower left-hand corner of the telegraph blank state whether it is to be sent "paid" or "collect." If a charge account has been arranged, the word "charge" should be noted. If it is desired that a report of delivery be made, or that a message be repeated, the sender should write at the top of the blank the words "Report Delivery" or "Repeat Back." When you wish an answer, do not say, "Wire at our expense," but write the words "Answer Collect." If the sender resides in an Eastern State, he should not overlook the fact that west of Chicago he has from one to three hours' time in his favor. Often in such a case, a day letter will arrive in good time and save on expense.

Abbreviations of weights and measures and of the names of cities, countries, provinces, etc., are counted as one word. If in a signature you write "Harry Smith and William Jones," you must pay for three extra words, but if you say "Harry and William," you get by without any additional cost. One sure way to delay a telegram is to try to save money by combining two words, illegitimately. Even if the message is accepted as written, it is checked and rechecked at every handling and the sender is likely to lose far more in service than he gained by his small fraud.

Telephone Manners and Methods. The telephone will never be the business asset it might be until our public telephone habits are improved. Every day in New York's vast traffic there are more than sixty thousand

wrong connections made as a result of incorrect numbers given by telephone users. These errors are distinct from the wrong connections made by operators misunderstanding numbers. Too many people rely upon memory instead of consulting the directory. And when the number is obtained we often forget that our personality has been put upon the wire. We are not face to face but voice to voice, which is more important, for the telephone reflects our accents and inflections perfectly.

Telephone courtesy on the part of its employees is a matter of vital concern to every business or industrial establishment. When an employee is speaking on company matters, he is "the company" to the person with whom he is talking. He has it in his power to win or lose friends for the corporation that pays for his services. Courtesy is peculiar in that the more of it we give away the more of it we have on hand. It is the refining oil that softens and lubricates daily affairs. It isn't always what is said, but rather how it is said, that counts. Many a man has gotten his bad opinion of a business organization from the rude telephone conduct of a dyspeptic employee.

Ten Commandments for Telephone Usage. Here are ten commandments for telephone usage that might be helpful to business houses which have not already corrected the problem.

1. Answer the telephone immediately. Two per cent. of all the calls that are made are wasted because the party calling gets impatient at the delay and hangs up. Many profitable business transactions that might have been landed thus fall through. Wires are held and other calls delayed.

2. Eliminate the waste of words that results from saying "Hello." Avoid preliminaries by announcing your name or that of your department or company. On answering the bell say, "Mr. Blank speaking."

3. Every call deserves prompt attention. If you are not the one wanted, get the right party. If he is out of the office, offer to take the message. You never know how important the matter may be.

4. Have a pad and pencil ready. Don't keep the caller holding the line while you search for paper to record the message.

5. Speak with courtesy. Remember that you are not face to face and therefore cannot soften the effect of a harsh voice by showing a winning smile. Don't try to impress the caller with your importance or attempt to convey the idea that you are fearfully busy. This is cheap bluff easily discerned. The caller has a right to be offended when you ring for office boys, give orders, and dictate sentences to a stenographer while holding the telephone conversation.

6. Try to visualize your man at the other end of the line. Keep your voice cordial. Concentrate on the business at hand. Speak in a low tone and distinctly, keeping your lips about one half inch from the mouth-piece of the instrument.

7. Don't try to save a minute at the other fellow's expense. If there is any waiting to be done, it is the caller's obligation to do it. Nothing is more aggravating to the average individual than to be called to the phone and then be told to "hold the wire." You wouldn't call on a man at his business and then continue to read a paper after he had signified that he was ready to see you.

8. If in calling you are given a wrong number, bear in mind that the person who answers is not to blame. He should be given the same treatment you would accord him if you walked into his office in error. To help avoid such mistakes always know the number; don't guess. Don't jiggle the hook to recall the operator. When you turn the light on and off too rapidly, like any other electric bulb, it may not glow. Move the hook up and down slowly.

9. In asking for your number pause slightly between the hundreds and tens. This helps the operator, for the numbers are arranged on the switchboard by hundreds and tens, and the operator locates them by first finding the right section of hundreds and then getting the exact "jack" for the tens given her.

10. Never forget that during a telephone talk you are the sole representative of your company to the party at the other end of the wire. Never forget the story of the buyer who called a certain business house, and when the private switchboard operator demanded sharply, "Who are you?" replied, "I'm a man who is through buying from your house as long as you are there."

Adhere to the old motto—"The voice with the smile wins."

Fire Prevention. No business manager worthy of the name can afford to overlook the subject of fire prevention and fireproof construction. In the past, protection against fire was viewed as a purely engineering matter, but to-day there are many who believe that the psychological phase of the subject is of greatest importance. This change of opinion was brought about by definite proof that the primary cause of fire is carelessness.

It is not possible to eliminate all the fires that are listed as strictly preventable. To do so we would first have to change human nature. But we can travel a long way on the road to improvement. If we fixed our chimneys and flues, we would cut down the loss 6 per cent. If we were careful in disposing of lighted matches, we would save a further $3\frac{1}{2}$ per cent. Carelessness in handling cigars, cigarettes, and pipes causes more than 4 per cent. of our blazes, while the improper use of electricity and electrical devices adds 8 per cent. to our fire hazard.

Uncleanliness and fire hazard go hand in hand, and this applies to the outside as well as the inside of a building. Any factory or business that provides an example of "poor housekeeping" also furnishes evidence that discipline is slack. An inspection of the plant where disorder rules generally reveals piles of litter in every out-of-the-way corner; there are usually an insufficient number of fire escapes, workmen are permitted to smoke on duty and stairways are blocked. The first rule of fire prevention is to clean up, and the second rule is to stay clean.

In every plant packing materials should be kept in a box or bin lined with tin and fitted with an automatic door. Waste cans should be placed at convenient points and carefully emptied daily. Discard stoves. Forbid the use of matches except those lighting on the prepared surface of the containing box. Keep oils outside of the main buildings except the small quantity needed for daily use. Catch oil in drip pans; never use boxes of sawdust. Keep the sidewalk, vault lights, and window-panes whole. Keep plastering and sheathing in repair so that nothing can be thrown into the

hollow space in the walls. Organize a fire brigade and see that there are plenty of casks and pails of water handy, as well as chemical extinguishers. Dry sand is fine for extinguishing fires in oils, varnish, and other inflammable fluids. As for fire hose, it may be interesting to know that the loss of head due to friction in the ordinary quality of hose may reach 25 or more pounds per 100 feet, while the loss in a good quality rubber-lined hose will amount to no more than 14 pounds per 100 feet.

It would be easy to continue suggestions of this kind to great length, but those given are sufficient at least to start a train of thought that may cause the reader to increase his present efforts along this line. And while on the subject, let us give a moment's consideration to the "watchman." One of the evils of the whole situation is the prevailing custom of employing as night watchman some aged decrepit workman who is no longer able to earn a living as an active employee. The many fires that have been caused by inefficient watchmen service bear witness to the need of employing picked men for this work. They should not only be intelligent, active, and courageous, but should be engaged in sufficient numbers to do the work properly and be paid salaries in keeping with the responsibility they assume. Guarding must be thoroughly done to be effective; half-way measures are a waste of time and money. Plenty of other and less dangerous jobs can be found for the old fellows who have earned the grateful remembrance of their employers.

Fireproof Building Construction. In talking recently on fireproof building construction, Dr. Ira H. Woolson,

expert consulting engineer, who has specialized on house construction, said:

I doubt if the average brick building as a whole has a fire-resistance of over ten per cent. of that of its walls. This is discreditable to our engineering and architectural intelligence. My criticism also applies to hollow tile, stone, and concrete buildings. Although brick, as a material, is especially adapted to withstand flame and high temperature for long periods, the world is full of tottering fire-ruined brick walls, now desolate monuments attesting the fire hazards of buildings improperly constructed.

The chief structural defect in present-day buildings is the communicating opening. It is these openings that cause the rapid spread of fire.

The great fire danger in many buildings is from open stairways and open elevator shafts. The number and variety of such communicating channels in most structures would almost lead one to believe that a fire fiend had planned them with diabolical cunning. Open stairways, although built of brick, stone, or metal, act as flues to carry the hot products of combustion from one floor to another. Most people do not know that when air is heated to one thousand degrees Fahrenheit or over—which is a temperature quickly reached in most fires—it will ignite instantly everything combustible with which it comes in contact. The actual flames of a fire may extend only a few feet from the point of origin, but the hot smoke and invisible heat waves may easily travel through an incombustible stairway or hallway for fifty to one hundred feet and then ignite the whole surface of a wooden door in an instant. At the same time, glass door panels and fanlights will collapse, by rapid expansion, and the intense heat entering the rooms will cause them to burst into flames.

The remedy is to protect hallways by fire-resistive partitions and fire doors, irrespective of whether there is any

combustible material in the hallways or not. Stairways and elevator shafts should be completely enclosed with fire-resistive materials, and glass doors or windows opening into such enclosures from the interior should be prohibited. Similar care should be exercised with ventilating ducts. It is surprising how small an opening through a wall or floor will suffice as a gateway for superheated air to start a fire on the opposite side. There is abundant proof that many fires are transmitted through fire-resistive floors and walls by superheated air flowing through the small openings around pipes. This occurs even though the opening does not exceed one fourth of an inch.

Millions of brick are used each year in buildings of simple architecture and modest cost. They are undoubtedly less liable to complete destruction by fire than wooden buildings, but are by no means as fire-resistive as they should be, nor are they as safe as the public is taught to believe.

In the foregoing we have an array of astonishing truths. The need appears to be not only for more brick, tile, or stone buildings, but for the right kind of careful construction.

Importance of Small Savings. Not only should it be the policy of a company to save on time, but an equal effort should be made to save on materials. The thoughtful executive does not overlook the fact that some rubber bands will last a year, while others will last four; some carbon paper will make fifteen clear copies, while other brands will make thirty. In one office the bookkeepers will work best with steel pens, while in another organization a saving in time has been effected through the use of a certain style of a fountain pen. Pens are temperamental things and are worth investigating. Some companies have saved considerable

sums of money by mailing printed matter in open-seal envelopes which travel through the mails with a penny postage.

In the careless handling of paper, for instance, many dollars are lost by the average business man. Certain grades of paper will not stand storage. Especially is this true of those made from ground pulp wood, which deteriorates rapidly, soon becoming brown and brittle. The bleached, chemical wood papers are not troubled in this way. Paper should not be stored in a room where there is direct sunlight. The place should be kept free from fumes and dust. Excessive dryness of the air causes the paper to become brittle, and it is advisable therefore to see that there is a good circulation of moistened air.

Concerning the use of ink, there is perhaps more indifference than ignorance. The open inkwell should be abolished. Not only will this help preserve the quality of the ink, but it will save in the amount used by decreasing evaporation. Sediment should not be allowed to accumulate; the inkwell should be cleaned frequently and fresh ink used each time it is refilled. Two kinds of ink should never be mixed for if this is done it is likely both will be spoiled unless they are of the same composition. The difficulty encountered in using a heavy ink in a fountain pen may be overcome by following the simple common-sense rule of first cleaning the barrel and point of the pen in warm water before filling it. Red or other colored inks should not be used on records of a permanent nature as they are almost sure to be altered by exposure to light.

A simple plan to test ink for permanency is to draw a series of lines on a sheet of writing paper and immerse

this record in water, allowing it to stand for twenty-four hours. This test will determine the ink's resistance to dampness and water. Another sheet with similar lines drawn on it should be partly covered with cardboard and exposed to the action of the sun and air, out of doors, for six or seven days. If the ink is permanent in quality, the exposed portions will show no evidences of alteration when compared with that part of the sheet that has been protected from the sunlight.

Another commonly used and much abused material is rubber. Rubber bands which would last five years if properly kept become useless in two or three months when allowed to lie on the desk exposed to the sun's rays. All rubber articles should be stored in a cool, dark place.

It is possible to save large sums of money by devoting a little more study to all the commodities that go to make up the items of expense in the office and factory. A saving of five per cent. on the annual cost of soaps, polishes, adhesives, disinfectants, preservatives, fuels, lubricants, lights, etc., if effected, would soon total a worthwhile sum. In carrying out such a plan of economy there is a great opportunity for every small concern in the United States that has no research laboratory to develop a sort of amateur efficiency expert whose business it would be to discover and remedy the small leaks, the innumerable small extravagances that are wholly unnecessary.

The errors that lead to failure are not those that occur in the handling of big and difficult problems. On the other hand, they are the little oversights and omissions such as signing documents without knowing their contents, neglecting to get and keep receipts after bills are

paid, inability to establish a standard of living so that one's expenses will not exceed his income and dissipate his savings, too little caution in starting credit accounts, and in investing money on mere hearsay without a proper knowledge of facts. Many a man has lost hard-earned dollars through simply neglecting to check up items on current bills and dozens of individuals have been compelled to face ruin simply because they were careless in the handling of valuable business papers. The thing that counts most in every-day life is the common-sense observance of well-known fundamentals of business conduct rather than any adherence to complex rules that have been mastered by only a fortunate few. The money saving that comes from eliminating waste is not the chief benefit that results. With all our science and skill, we cannot duplicate the work that nature has been hundreds and thousands of years in performing. When we prevent the waste of a ton of paper, we have saved eight trees of full growth. If we could collect every pound of paper that is now going to the dumps throughout the United States, we would be saving upward of one and a quarter million trees annually. Think what this would mean in the saving of human labor. Further, let us remember that labor saved means increased individual production and higher wages.

Keeping down Automobile Operating Costs. If by paying attention to the so-called "small leaks" considerable saving can be effected annually in the cost of doing business, then how much more reason is there to watch closely for the possibility of large but nevertheless unnoticed wastes outside of the plant or office. No better opportunity exists for the exercise of strict

economy in this respect than in connection with the use of automobiles, whether it be for business or pleasure purposes. The truly efficient executive will make it his duty to keep down the costs of maintaining company-owned automobiles by insisting that all precautions be taken in operating them. In the matter of tire saving alone there is a fertile field for his endeavors.

It is estimated that there are about eight million automobiles now operating in the United States. Tire manufacturers insist that not less than 1000 additional miles could be obtained from each tire used in the United States if owners of cars would only exercise reasonable care and observe a few common-sense rules. The short life of automobile tires is largely due to the fact that the owner or driver of a machine is able to visualize only the wearing action on the tire tread, and does not understand the true nature of the conditions that put an unnecessary strain on the fabric portion of the shoe. The carcass of the tire is actually the hard-working part of it, and should be given as great protection as the exposed rubber surface.

Under-inflation is the "white plague" of the pneumatic tire, and more damage results from having the tires too soft than from any other cause. The general rule is to see that a tire has 20 pounds of pressure for each inch of its diameter. A 3-inch tire should be inflated to 60 pounds. A 3½-inch tire should have 70 pounds, a 4-inch tire 80, etc. Repair-shop statistics indicate that from 70 to 80 per cent. of all tire troubles come from insufficient inflation. A tire should be inflated so that the least possible amount of surface touches the ground. When the tire is not properly rounded out, there is a traction wave just ahead of the

point of contact between the tire and the road at each revolution of the wheel. This constant wave produces friction, loosens the layers of fabric that make up the carcass, produces heat, and destroys the shoe.

The side walls are the thinnest part of a pneumatic tire, and when the shoe is soft, there is a kneading and bending action that eventually cracks the fabric in very much the same manner that a wire is broken when it is bent back and forth. When the tires on a car are properly inflated, the machine will require less gasoline. This can be proved to the satisfaction of anyone who will try to push his car, first with the tires hard and then with the tires soft, and observe the difference in the effort required. When a tire is properly inflated, and strikes a small object in the road, it will likely bound off without being affected; however, when the tire is soft, it is more liable to roll over a stone, piece of glass, or nail, instead of throwing the object to one side. The best known puncture-preventive is plenty of air. The soft tire will pick up two sharp objects to one that will enter a properly inflated shoe.

The practice of trying to tell how much air is in a tire by striking or kicking it is a foolish and futile procedure. The only way to determine the degree of tire inflation is to purchase and regularly use a reliable air-gage. Such an instrument also provides a means to detect slow leaks. Authorities seem to be agreed that summer heat has no dangerous effect on the air in tires. These experts declare that pressure should not be reduced in hot weather, for only extreme heat could ever increase the air pressure in a shoe to a degree that would be injurious.

If a tire is punctured, the driver should immediately

stop. No one can drive on a flat tire, even for a block, without seriously injuring the casing. If the puncture is serious, and an extra shoe is not on hand, it is better to remove the tire from the rim entirely and proceed slowly. A large loss is occasioned by motorists who follow the plan of running on a flat tire a short distance to the nearest garage. The driver who does this may not be punished right away, but in a few days or weeks he will again have tire trouble to remind him of his folly.

The tread of each tire should be inspected at least once every week. All cuts, no matter how small, should be vulcanized at the earliest possible moment. Sand and gravel are the great enemies of rubber, and they will quickly destroy a casing if permitted to be ground into the tire. It is a good plan to carry along some tire dough and fill all minor cuts on the road. This practice will keep out sand and gravel, which would otherwise work into the tire. Blowout patches should be used for temporary repairs only—permanent vulcanized treatment should be given the tire at the earliest opportunity. When blowout patches are used for any length of time, they heat and chafe the inside of the tire. The motorist should avoid running in car tracks and ruts, for this not only wears, but places a strain upon the side-walls of the casing. Just as the upper of a shoe is not built to withstand the same amount of wear that is given to the sole, so the sides of a tire are not built as strong as the tread.

Quick starting and stopping, as well as fast driving around corners, are costly habits so far as tires are concerned. Of course, it sometimes happens that one must stop quickly, and the bad effects of such action can

be materially lessened by keeping the brakes in perfect adjustment so that the rear wheels will take up equal portions of the strain. When the clutch is thrown in quickly, or in a violent manner, this has the same effect on the tires as if they were struck a hard blow. Great care should be exercised to see that the wheels are in proper alignment. If they run at a slight angle to the direction in which the car is traveling, this quickly wears down the casing of the shoe. By carefully using a straight-edge or even a long stick to measure the front and rear distances between each pair of tires, any person may quickly determine whether the wheels are properly aligned. Skidding ruins tires, and may be partially controlled in certain cases by turning the front wheels in the same direction in which the rear wheels start to slide. A very narrow road or obstacles may prevent the driver from doing this.

Many tires are ruined by people who try to make "straight-side" tires fit "clincher" rims, and vice versa. Such misapplication is also responsible for many accidents. On the other hand, considerable benefit will often result to the motorist who follows the plan of using larger tires on his car than those first put on it by the automobile manufacturer. Over-size tires will fit existing rims, and the added cost is but slight. Many car purchasers now specify a larger size of tires on their machines than is customarily supplied by the maker of the car. Overloading is the twin sister of under-inflation, and the use of large tires helps to relieve the evil consequences resulting from carrying too much weight in the machine.

Since oil softens rubber, the floor of the garage should be kept free from it. No oil or grease should be per-

mitted to come in contact with inner tubes, which are best carried in a bag. Before folding up the spare tube, a piece of rag should be wrapped around the valve stem to prevent the sharp point from piercing the tube. Spare casings carried on the side or the back of the car should be kept in a casing cover so the tire will not be injured by heat and light. It is a good plan to change the front and rear tires, if they are of the same size, when the rear shoes start to show wear. It is also advisable to change the tires from the right to the left side of the car, so that any side wear will be equalized. Speeding kills casings. The tires will wear more when a car is driven one hundred miles in two hours than if the same car takes five hours to make the same run.

Under no circumstances should the owner of a car store it for the winter without jacking the machine up and removing the weight from the tires. Although the shoes may be left on the rims if desired, it is best to remove them. In either case the air pressure should be lessened, leaving in only enough to keep the tires rounded out. A good time to make repairs is at the commencement of winter when the car is laid up. This affords an excellent opportunity to examine the tires carefully, and if they need fixing the work can be promptly and satisfactorily done because the repair shops have more time on their hands during this dull season of the year. Before putting the tires away for the winter months, the casing should be carefully washed with soap and water, to remove all oil and grease.

It is best to keep tires in a cool, dark place, where the temperature never goes above 55 or 60 degrees. Both extreme heat and cold cause a deterioration in rubber. Casings should be wrapped in heavy paper or burlap,

and they should be laid flat—not hung on a peg or leaned against a wall. It is generally best to inflate the tubes to about 5 pounds pressure and put them back into the cases. Before the tires are put on again in the spring, the rims of the car wheels should be carefully cleaned of dirt and rust and then treated to a coat of shellac.

If every official responsible for the operation of a company's automobiles would see to it that those using the machines observe the ordinary precautions in driving and examine the tires at frequent intervals, the total of the individual savings would build hundreds of miles of much-needed good roads. A thousand miles saved on each tire would reduce the nation's automobile bill fifteen or twenty per cent. which would work a saving of many millions of dollars, without great inconvenience to anyone or the exercise of much real labor.

Wasteful Philanthropy. Not to be separated from the small leaks that are to be found in many businesses is that of false philanthropic giving. The giver, of course, acts in perfect good faith, but the recipient quite often does not. The most inefficient thing in the world is the dollar donated to fake charities. Several instances will show the utter futility of promiscuous giving, or giving without investigation. A prominent merchant in a large city had been sending a yearly check to a man who bore the self-styled title of "Reverend," and who resided in another city a thousand miles away. One day, it occurred to the business man to look up the party to whom he had been giving for twenty years, and see if the reverend gentleman's activities really were as praiseworthy as they had been set forth.

The investigation brought out the facts that the man

was not a minister of any denomination or a representative of any organization; his solicitations netted him considerable sums of money; he spared no expense in satisfying his personal desires; some years before, he had been arrested in two Southern cities on felony charges; he claimed to assist young boys, but was reticent on this subject. The merchant of course stopped his annual donations to this dubious cause, but think what a loss he had already sustained.

In many cases, even when the cause is worthy, the plan followed in getting contributions does not permit much of the money to reach the charity that needs it. Take for instance the case of a magazine selling for 10 cents and devoted to the subject of anti-tuberculosis work. The agents maintained that the proceeds were applied to sending tubercular children to an institution in a Southern State, and caring for them there. An examination showed that of every 10 cents collected the solicitor got four and the managing agent two. The financial report of the organization indicated that \$4000 had been spent on the general maintainance of the home while \$25,000 had been applied to printing, headquarters expense, and overhead charges. In other words, only 16 per cent. of the total money reaching headquarters was used to benefit the children. Furthermore, this 16 per cent. was only about 6 per cent. of the gross receipts.

Many schemes of the kind here described are successful only because the people of most communities are careless in their habits of giving. Often the fault lies with people who permit the indiscriminate use of their names and influence. If the people in whose name the public is solicited were to be held responsible for any

and all deception that is practiced, a different story would be told. One case is recited of an organization seemingly created for a laudable purpose, and on whose letterhead were listed the names of about thirty men, all of whom appear in *Who's Who in America*. Letters sent to these individuals elicited the information that nearly all of them knew practically nothing of how the funds were being expended, and not one was familiar with the plans of management. None assumed any responsibility whatever. A few of the men had never consented to the use of their names.

On the letterhead of another society of national scope appeared the names of prominent men, among them those of a former Secretary of War of the United States and a former United States ambassador. An official investigator inquired of these gentlemen as to whether or not they were giving personal attention to the conduct of the association. The former cabinet member replied that he did not know much about the organization himself, but he had unbounded faith in his friend the former ambassador. The latter, on his part, replied that the committee on which he served carried no responsibility, this being vested in the trustees; he was interested only in an advisory capacity. In such cases, there is no doubt that people throughout the country took it for granted that the men named were acquainted with all the activities of the society, and many contributions were given by people who were so impressed.

In the matter of giving, it might be well for all of us to bear in mind a few simple rules mentioned by Mrs. Mosiman of the Charity Organization Society in New York. An observance of these will tend to reduce the

sum total of losses which now occur. First, require that collectors show their credentials. Second, do not contribute just to get rid of a solicitor. Third, do not give to any organization that has only a post-office box number for an address. Fourth, mail your check to the treasurer—don't give cash to the collector. Fifth, beware of the concern that does not make a public annual financial statement. Sixth, be very careful about giving to a one-man organization—investigate first. Seventh, there is no disgrace in giving wisely.

CHAPTER VIII

FOREIGN TRADE PROBLEMS AND PRACTICES

America's Attitude Toward Foreign Trade—Factors Underlying Foreign Trade—Financing Problems—Legislation to Aid Foreign Trade—Competition for World Markets—Possibilities in Foreign Trade—Suggestions to American Exporters—Foreign Advertising—Importance of Adequate Terminal Facilities—Cargo-Handling Apparatus—Economy in Freight Handling.

America's Attitude Toward Foreign Trade. In the course of some remarks on foreign trade, a well-known banker stated that Americans seem to be possessed of a pronounced tendency toward self-depreciation in their efforts to build up and develop foreign trade markets for their goods. The whole problem, it would appear, is taken too seriously. At home we are impressed with our importance and efficiency, and discuss the difficulties of domestic trade in a cheerful and rational manner. But when the subject of trade with foreign countries is mentioned, we act as though something had just been loosed from a chamber of horrors, and our confidence disappears. We exaggerate the weakness of our own position and dwell on the merits of the other fellow.

All we need abroad are the same national characteristics we win with at home. The American who goes into the foreign field without the confidence, optimism, courage, and audacity which are so characteristic of our people starts on this adventure seriously handicapped. In the past we have been successful in our efforts to

trade with foreign peoples. In the two decades preceding the war, our progress in the development of world business was greater than that of Germany and nearly as great as that of England. Of course, we have made mistakes—we do that here at home—but we view irregularities which crop up abroad in a manner that is so tragic it would be funny were it not for the bad effect of our actions upon the foreign customer. We constantly provide him with an argument against ourselves, for like most other customers, the foreigner is ready and anxious to be spoiled. If we, ourselves, start the hue and cry against American business methods in the foreign field every time a trifling and wholly unavoidable business error occurs, we can be perfectly certain that our competitors and prospective customers in other lands will join enthusiastically in the tumult of criticism.

In the realm of export finance we worry about matters that we have reason to take for granted. We have seen our national banking system pass through the most trying period in history, and we have watched it emerge without a scratch. Still there are many Americans who are wondering if our bankers will be able to meet the demands of the future; worrying about our ability to respond to the call for an extension of facilities; discussing the possibility that we will have to create some new breed of financial institution to safeguard and satisfy American interests in other world centers.

A study of the question will prove that we have no reason to be uneasy. Our supreme position in a stricken world, although not chosen by ourselves or others, is a definite fact. Even if we are the dominant power among the nations, it is not expected that we shall at-

tempt to solve the world's problems unaided. The United States must sit at the helm, but other countries will help. The worst injury we can do foreign nations is to discount their true possibilities. After the Napoleonic wars, France experienced domestic chaos in about the same degree as now prevails in Russia. However, the French quickly disposed of their burdens and settled a war indemnity that their conquerors boasted would cripple them for a hundred years. Many nations, now seemingly helpless, will soon regain their stride, and we may make a mistake in believing that the task of smoothing out the kinks in a disorganized world is a job for Uncle Sam alone, instead of a joint effort by all nations for the good of the whole human race. Let us not be funereal about matters that will be handled in a satisfactory fashion.

What we need is less gloom and more vision. All of us have got to accumulate a world-wide outlook. Some of our American companies are going after foreign business in a most aggressive and thorough fashion. But there are many other concerns that have not even scratched the surface in their investigations. Take Latin America, for instance; how many people realize that the area of that country is nearly three times as large as the area of the United States, exclusive of Alaska. How many of us know that the republics of Central and South America contain 80,000,000 people; that Brazil alone has a larger area than Continental United States; that although Brazil imports about \$200,000,000 worth of goods yearly, we furnish only 39 per cent. of her imports; that of Argentina's \$210,000,000 worth of imports, Uncle Sam supplies only 29 per cent., and that our imports from the twenty

Latin American Republics total more than a billion dollars, while our exports are less than three fourths as much.

Concerning the Far East we have much to learn. China proper is only one half as large as the United States, but has three times the population. Japan is only a little larger than Montana, but contains nearly sixty million people. India and the British dependencies are also only one half as large as our country, including Alaska, but are inhabited by more people than live in China. Even Java, with an area only half as large as Colorado, has a population of thirty million; all of which goes to show that citizens of the United States will do well to base their foreign trade efforts on the true assumption that the world is quite some market in which to do business.

If we aspire to play a big part in world-trade, we must expect to be confronted by some difficult problems. American manufacturers have learned many valuable lessons in the last few years. It used to be imagined that in order for an American to do business with foreigners he would have to send out salesmen who could not only talk the language, but who possessed characteristics identical with the traits of the people he was endeavoring to reach. Now it is known that the best man to sell American-made goods is the typical American salesman who possesses United States energy and initiative and does things the United States way. He preserves American ideals and develops our own distinctive individuality abroad.

It should not be forgotten that the chemist and his fellow engineers have added impetus to our domestic trade and that in adapting our goods to foreign mar-

kets these same men can smooth out many a rough place. Different countries have different likings. A product may suit the people in Chicago, but lack popularity in Peking. Perhaps the engineer or the chemist can effect a slight change of color, shape, or quality that will open a new market.

If it were not for the close coöperation between the Danish chemists and the agricultural interests of that land, the little kingdom of Denmark, with less than three million people, would not be able to sell \$150,000,000 worth of bacon, butter, and eggs in London, practically dominating that city's trade in those commodities. If the eggs from Danish poultry-farms are not up to a proper standard, the export society gets busy and the farmer's hens, housing, diet, and treatment are investigated and a remedy applied, not by the farmer himself, but by the scientific institution which speaks for the larger united interest of which the producer and exporter are parts. The same care can be exercised to great advantage in everything from shoes to ships. We can't always induce the other fellows to eat and wear what we do, but we can adapt our goods to meet their tastes.

Factors underlying Foreign Trade. Every American citizen, whether he manufactures something for export or not, should immediately accept the view that the present and future foreign-trade business of the United States is not only a matter of great national importance, but is his own personal problem. Being a new country, sparsely populated, and having great natural resources, we have not found it necessary in past years to produce goods for export in competition with the cheap labor of other nations. More money was to be made by

developing our own resources and selling chiefly food and raw materials to other countries than by manufacturing finished articles for export.

This whole situation has recently undergone a material change, and now our productive capacity in many lines of manufacturing has been developed to such a point that we must either establish foreign markets for our goods or curtail our output. In other words, we can maintain our lead among nations only by becoming a world power, commercially as well as financially.

In this question of foreign trade the principal thought of the present moment may be grouped under three heads: First, what we have done to prepare ourselves; second, what other nations are doing; third, what we should do.

We have developed the greatest home market of any country in the world, and this makes it possible for us to organize production upon a large scale. We have installed more labor-saving machinery in our various plants than has any other country, and this, with our enormous outputs and our abundant supplies of raw materials, enables American manufacturers to produce a great many articles at a lower cost than the same things can be produced for in foreign countries with cheaper labor. As an example, we may take our automobile industry, in which the workers receive higher wages than do similar employees in other countries, and yet motor cars are here produced at a lower cost. The bugaboo of cheap foreign labor is becoming less of a problem for us each year.

Financing Problems. It is now clear to most Americans that we have been laboring under a fallacy in

assuming that if we buy from any particular country that nation is called upon to purchase a corresponding amount of American goods. The truth is that when a country sells its goods to us or to any other nation the transaction simply means that the selling country is entitled to receive from the world at large a corresponding sum of money to its credit wherever that credit may be utilized to the greatest advantage. Furthermore, this credit can and does buy goods and service from whatever country the things can most economically be obtained. The fact is that when any country purchases goods or borrows money it has to settle with the world in general, and not with the individual seller or lender. The world will arrange in some way to take payment for the credit by purchasing goods from the country that has borrowed money or bought supplies.

While we have been accumulating a more complete understanding of the fundamentals of foreign trade, the government has been doing quite a little effective work in the way of legislation that is certain to help our exporters materially. Our Federal Reserve Act was designed to help American banks and corporations engaged in financing international trade, but payments under that act must be made in liquid paper of short maturities. In the countries that have been devastated, and where the largest purchases will be made, payments for goods can only be made through the buyer's giving as security for his purchase corporate bonds which will mature eight or ten years hence. Under the Federal Act mentioned the American manufacturer could not accept such payment, for to do so would cause him to tie up and lose the use of capital required in his business. This would mean that he would lose the sale.

Legislation to Aid Foreign Trade. To overcome this difficulty we now have the Edge Act, permitting the creation of international banks, with power to deal in long-term foreign credits. This law also permits these banks, which are under Federal charter, to guarantee notes and bills based on foreign commercial transactions, and gives them authority to purchase foreign bills, notes, and obligations from American exporters, and to issue against such obligations and securities their own acceptances, debentures, and other obligations. To sum up, the act provides a system of financing our foreign trade whereby the collateral of foreign purchasers may be taken in payment for American goods. This law will probably do more than all else to help us hold and build our foreign trade.

The Webb-Pomerene Act, as is well known, permits the organization of certain combinations of our competing manufacturers who are seeking to secure business in foreign markets. This legislation enables the American exporters to meet the severe competition of similarly organized coalitions, encouraged by the laws of the principal European countries.

In some of our industries the manufacturers have taken advantage of the Webb law by forming a stock company, of which corporation the participating manufacturers subscribe to the stock. The affairs of the concern are managed by a board of trustees, and all sales are made through this company for the stockholding members. The corporation also undertakes the promotion work, and is the sole point of contact between the industry and the foreign market.

In a few industries the manufacturers have organized subsidiary export companies, which have later been

united in an association of export corporations for the purpose of agreeing upon prices, terms of credit, allotment of territory, and so on.

In this case each subsidiary export company carries on its own promotion work and maintains its own sales force and agencies abroad. The first-mentioned plan appears to be the most effective and most popular.

The Federal Trade Commission is taking a great interest in our export work and is carrying on extensive investigations of foreign conditions, practices, and export combinations. The commission has asked that American exporters keep it informed of their experiences and report instances where any branch of our export business has been restrained or injuriously affected by any agency.

It is now fully recognized that in order to conduct a large business with foreign countries we must perfect a plan whereby American exporters can procure accurate information concerning the standing and responsibility of the foreign purchasers. Efforts are now being made through the establishment of American chambers of commerce and other agencies in the principal foreign centers to provide an overseas credit system for the clearance of information of a reliable character concerning the financial credit of the foreign buyers.

Unless this is done, and soon, our trade with other countries is sure to be seriously handicapped through the hesitancy in granting credit that will be exhibited by United States exporters. Our international information and credit service must be developed to the same efficiency that now exists here in our own country.

Competition for World Markets. Americans should completely abandon the idea that other nations are leaving the foreign field to us. France proposes to organize and send special trains of cars over the railroads of certain countries in order to exhibit French manufactures and rouse interest in its goods. This effort will also include an attempt to attract tourists. Motion-picture films will show French scenes. It is true that during the war France lost 600,000 industrial workers and 600,000 buildings. Some of her richest mining and manufacturing regions were devastated, and she lost 30 per cent. of her merchant fleet.

However, the present taxation in France is designed to yield 20,000,000,000 francs, or four times more than the pre-war total. Frenchmen have really gone to work, and the nation is putting forth one grand effort to rise from the ruins of the war.

Great Britain also is conducting a unique advertising campaign under the auspices of the Federation of British Industries. This organization is compiling an export register listing and classifying the products of all British manufacturers, and is distributing the pamphlet throughout the world. The British Government is also developing a traveling exhibition of British-made goods. This action is based on the thought that few if any manufacturers have either the facilities or capital necessary to provide such exhibits.

This show, which is intended to build up foreign trade, will be exhibited first in South Africa, Australia, New Zealand, and Canada. It is expected that the exhibition will be made a permanent institution, and will be sent to all parts of the world. There will be more than four hundred exhibitors, and all of them will

be strictly British. No concern will be permitted to participate if controlled by foreign capital, even if the plants are operating on British soil.

The recently established British trade-commissioner service of the Federation of British Industries is meeting with much success. These commissioners collect information, provide rooms for the display of samples, distribute British catalogs and keep a close watch on trade statistics in all parts of the world.

Most of the important industries of Great Britain have now formed their export associations, and these combinations propose to regain the export trade lost during the war, and in addition develop new foreign markets. Reports indicate that the British are planning to control all the markets leading to the East. In order to do this with the least possible strain upon her credit resources, Great Britain has formed the Anglo-Danubian Association, which organization will rehabilitate those countries that once formed the Austro-Hungarian monarchy.

The plan is to furnish raw materials to points where manufacturing facilities are lying idle, to control this material through each stage of transformation, and to deduct from the final sale price of the finished goods a sum which may be called a manufacturing commission, payable to the factories.

Possibilities in Foreign Trade. Japan had a financial upset in April, 1920, during which Japanese speculators lost upward of \$1,000,000,000. The panic came as a reaction against wartime prosperity. Merchants and manufacturers had carelessly increased their business, and became involved in difficulties. However, recent reports indicate that the Japanese are rapidly

recovering, and their plans include a tremendous effort to control large foreign markets.

Italy was the only country among the recent belligerents to go through the war without drawing to any extent on the American market. She borrowed \$25,000,000 in 1916, but cancelled the debt in 1918. Aside from her war debt of four billions, which is purely an obligation of the Italian Government, she is weighed down by practically nothing in the way of foreign debts. Her treasury resources, supplemented by the indemnities from her former enemies will, the government hopes, meet all of Italy's obligations.

The inflation in Italy is being rapidly reduced. An unreasonably high cost of transportation and excessive custom house duties are now preventing America from sharing largely in the trade with Italy.

All of the important nations of Europe are getting back into their old stride. It is further true that these foreign peoples are not spending much money foolishly, which can hardly be said for the citizens of our own country. In a recent month, six countries of Europe imported from the United States \$107,097,000 worth of necessities. They spent only \$21,000,000 for what are termed luxuries, or non-essentials. The ratio of luxuries to necessities was as follows: Belgium, 13 per cent.; Denmark, 43 per cent.; France, 16 per cent.; Germany, 10 per cent.; England, 28 per cent.; and Italy, 8 per cent. In other words, of each dollar Europe spent in America nearly 84 per cent. purchased necessities.

As compared with such a record, it is worth noting that last year, out of a total of \$105,000,000 worth of exports from the Paris region to the United States,

\$10,000,000 was for the single item antiquities. The value of the articles in this latter item represented more than twice the value of all the gowns imported from the same region by American firms, and equalled the value of all the silk and toilet articles bought by us in the same district. This certainly does not indicate that we are spending our money for necessities.

Suggestions to American Exporters. Any attempt to present a complete and detailed series of suggestions concerning the plans and methods American exporters should adopt and develop would extend this chapter into a lengthy discussion. Here are a few points, however, that may be worth thinking about. The exporter must make a careful study of each particular market, and furnish the style of goods there required. Goods are likely to receive rough handling, and should be carefully packed. In certain countries, Colombia, for instance, the tariff law is based on the gross weight of the package. In such a case, though the goods must be substantially put up, they should be shipped in as light a container as possible, since every unnecessary pound means a dead loss to the buyer and an increase in the cost price. When packages contain articles that pay different rates of duty, the entire package is generally taxed at the rate of the article carrying the highest tax, unless the net weight of each separate article is stated on the consular invoice and the weight of the container and packing is given separately to make the total. In certain countries where there are few railroads, and the packages must be transported by wagon or on mules, the separate packages should not weigh more than 150 pounds.

Many reports recently received in the United States

indicate clearly that some American exporters are ruining not only their own business but that of all American houses through careless packing. Kegs that originally contained nuts have arrived in the Orient without any contents. Pieces of machinery reached purchasers with the boxing entirely eliminated. A bale of cotton goods arrived at its destination in China with only a small portion of the bag still attached. Many shipments have reached foreign ports without marking or brands, and have been sold at auction. The advice of our American consul is: "Try to see that the wrapping and the goods reach the destination together."

It is well to remember that small export shipments can now be made through the parcel post. This international postal service makes it possible for customers in other countries to buy from America in small quantities, which they could not do when ocean freight was the only means of shipment. It is now possible for small foreign firms to add American goods to their lines, whereas in the past it was unprofitable for them to import small stocks, due to the prohibitive transportation charges.

The American business man must be reasonable in his terms. When he asks cash in New York this generally means that the buyer must pay for the goods from two to four months before he receives them.

American manufacturers desirous of procuring foreign business should not fail to take advantage of the splendid service offered by the American consuls in the larger foreign centers. The exporter should place his catalog on file, as the American consulates keep systematic indexes and files of commercial reference libraries. These are brought to the attention of prospective buyers of American products. In writing his

foreign advertisement the exporter can then say, "Our catalogs are on file at the American consulates throughout the world."

Foreign Advertising. Foreign advertising should take into careful account the psychology of the people it is intended to reach. Some exporters have gone ahead without even knowing the language most commonly used in the country whose market they are after. In the Philippines, for instance, English rather than Spanish is the commercial language, and 90 per cent. of the retail merchants, the final distributors, are Chinese. Down in Brazil, which country is often classified as Spanish-American, advertising literature and correspondence should be written in Portuguese if possible. French or English is the second choice, while Spanish is used last. French is taught in all schools and generally spoken by the better class.

Probably nothing is more important in building up a foreign-trade business than the selection of proper salesmen. A man may be well adapted to do business in one country, and yet be a miserable failure in dealing with the people of some other nation. In this connection there are many things to consider. For instance, in India the salesman sent there should be given full executive authority by his firm. The proprietors of Indian companies, many of whom are wealthy, much prefer to deal with men of an equal status. The Indian business man pays considerable attention to social amenities. If the man who is selling goods in India is not a member of the American firm he represents, he should carefully but widely advertise the fact that he has been given full authority to act for his company in all matters, however important.

There are 315,000,000 people in India, and not less than 5,000,000 are prospects for the sale of American goods. Though the industries of the country are still in their infancy, there are 240 mines now operating, while hundreds of factories are engaged in manufacturing soap, sugar, chemicals, cars, and textiles. England has barely scratched the surface of the possibilities in India. American goods are popular and have gained the reputation of being superior in quality to Japanese manufactures. Just as it is necessary to make a study of the characteristics of the people of India if the exporter hopes to develop a market there, so is it essential to do the same thing in China and other big markets.

It has been common talk in America for many months that the defects in our labor and financial situations can only be remedied by some form of industrial depression throughout the country, during which time the nation would have to undergo an industrial house cleaning. If there is any truth at all in this idea of coming hard times, the very best insurance we can build up to safeguard the nation and soften the evil effects resulting from a slowing down of business is a strong export trade that will carry American manufactures to all parts of the earth. It is not a game, however, that can be won without effort and study.

Importance of Adequate Terminal Facilities. The most important element in the serious problem of building a great foreign trade is the provision of adequate modern port and harbor terminals. There must be no rough spot in the continuous movement of freight from the factory to the hold of the ocean-going steamship in the harbor. In entering the world markets on a large scale, we are coming into competition with

maritime nations that have devoted generations to the study of ship economics.

American ships operate with wage scales nearly double those paid to the seamen of other countries, and our only salvation is to increase efficiency and individual accomplishment beyond anything attained by other nations. That we can do this is borne out by instances of isolated accomplishment in a few industries. Up on the Great Lakes, cargo carriers have been able to transport iron ore for a lower charge than any other tonnage rates in the world. Such results have been made possible by the use of wonderful loading and unloading devices. The time that a ship loses in port is absolute waste. The United States government learned this truth during the war, and in those strenuous days Uncle Sam requisitioned the brains of the nations leading mechanical experts, to solve the problem of rapid ship loading.

Let us take for instance the task of coaling large steamers. Over in Japan, at the port of Nagasaki, the Japs handle the coal in hand baskets. To bunker 3000 tons of coal, this method requires 950 stevedores and operators working 20 hours. Each laborer handles about 314 pounds per hour and the total effort amounts to 10,000 man-hours. To do a similar job in New York with buckets, but loading 8000 tons instead of 3000, requires 10 gangs of 40 hours. Each laborer handles 1666 pounds per hour, and the total effort is 9600 man-hours. But if we coal in New York, and use eight modern elevators and trimmers, we can load 8000 tons of coal with 96 men in 10 hours. Each man will average 8.33 tons per hour, and the total effort will be 960 man-hours. Think of that! Only 960

man-hours in New York with machines, as compared with nearly ten times that effort in Japan where the laborers do the task by hand and load less than one half the same tonnage of coal.

Perhaps the greatest adaptation of machinery to the business of loading a ship is the continuous elevator conveyor for medium-sized packages. When this device is operated in conjunction with a modern crane hoist for the heavier freight, it affords an appreciable reduction in labor; increases the speed of loading from 25 to 75 per cent.; saves on electric-current consumption, and practically eliminates the damage to goods common in the more primitive methods of cargo handling.

Cargo-handling Apparatus. But loading ships is not the only thing. The job of quickly removing the cargo is just as important. Under the old hand-truck system, freight could only be stacked to a height of five feet. This caused the introduction of stacking machines which now stack freight to a height of 15 or 20 feet, thereby trebling or quadrupling the amount of use that can be obtained from the limited floor space of a warehouse or pier. The overhead conveyor, although not yet installed in many terminals, will soon be considered a common necessity in handling cargo for ships. This device obviates the necessity for wide aisles for the passage of trucks, and acts as a great aid in stacking.

Down in Beaumont, Texas, there is a port which the natives brag about, and not without reason. In March of 1920, the Beaumont terminal established an enviable record in unloading 2013 barrels of asphalt in eight and a half hours. The cargo moved at the rate of four and a half barrels per minute, and the total cost for handling

the entire shipment of 1,051,500 pounds was \$25.16. This accomplishment was due entirely to the very modern mechanical equipment in the Beaumont terminal. The port of New Orleans is a great receiving station for Central American bananas. This product must be handled with care to avoid bruising the fruit. A careful study of the situation resulted in the installation of endless-belt conveyors which handle thousands of bunches per hour without injuring a single bunch. The operators have become so proficient in unloading the fruit, that within three hours after a banana ship docks in New Orleans, all of its cargo is riding north in special trains of refrigerator cars.

Galveston lays claim to the honor of being the speediest ship terminal in America. This port uses electric wharf cranes and is able to clear a ship in 24 hours. Seattle on the Pacific and Norfolk on the Atlantic are following close in the wake of Galveston. The largest pier in the world is at Seattle. It is 310 feet wide and one half mile long. It has a berthing capacity of seven large ocean-going vessels. The largest piers on the Atlantic Coast do not exceed 1600 feet in length. However, up to the present time, the best examples of how to handle cargo are still found on the Great Lakes. It is possible to load a ton of ore in Duluth, carry it to Conneaut and there unload it, all for the small cost of 50 cents. This is accomplished by ships that are laid up during the four cold months of the year and that pay American wages to seamen and officers. What could we not accomplish if our ocean traffic were as well managed?

Economy in Freight-handling. Perhaps the task of properly stowing cargo in the hold of a steamship will

remain a job for human hands for some time to come, but certainly there is no excuse for a lack of mechanical means in getting the freight into a vessel. Perfected machines are now available for complicated freight-handling, and such devices not only reduce the number of laborers employed on docks, but greatly lessen the time wasted in loading and unloading our water carriers. When we increase the number of trips a ship can make per year, we automatically add to the cargo space available for the country's commerce.

H. L. Aldrich, expert engineer and former publisher of *Marine Engineering*, in giving his views in this matter recently said:

There is the possibility of effecting a saving of over \$50,000,000 a year in handling freight at marine terminals. Statistics of a few years ago indicated that 300,000,000 tons of miscellaneous freight were handled at marine terminals in the United States in one year. The total is far greater to-day. This material has to be handled twice—first at the shipping terminal and later at the receiving station or point of destination. It is safe, therefore, to assume that America handles more than 600,000,000 tons of freight annually at its marine terminals, and this business is carried on with appalling lack of modern freight-handling machinery.

This tardiness in progress is due largely to the fact that the men in charge of freight-handling have grown up from the ranks, have limited ideas, and are opposed to new methods. Politics is also a bit to blame in the matter. The recent war opened our eyes. Modern machinery at Rouen, France, increased the capacity of that freight-handling terminal from 483 tons per linear yard to 1121 tons. At Marseilles, the improvement was from 665 tons to 1694 tons. Here in the United States, there are only six or seven docks

equipped with cranes and other modern freight-handling machinery, yet in the port of Hamburg, Germany, even before the war, there were 700 traveling quay cranes, together with more than 200 winches and cranes in the warehouses.

Our Mississippi River has 4000 miles of navigable waters; but there is hardly a landing in all these miles where there is modern cargo-handling machinery. On the River Rhine in 1913, with only 355 miles of navigable waters, there were 65 harbors with more than 400 well equipped warehouses, and 600 cranes and other appliances for handling freight.

A recent investigation showed that the cost of the carriage of water-borne freight was only 40 per cent. of the total, whereas the cost of handling freight at terminals was 60 per cent. It is only in changing the rates of 60 to 40 that we can economize, and this can only be effected through the use of efficient machinery. It is appalling that our terminal costs should exceed the charges for carrying goods.

Not long ago, my office overlooked a part of the waterfront in lower New York. I could look from my windows down on to a dock where heavy freight was unloaded. The only machinery on the pier was an old derrick. One day a float tied up at this dock, and on the float was a flat car containing several large steel plates. It took sixteen men, with the assistance of the old derrick, which revolved at the terrific speed of about ten revolutions per minute, to lift each plate from the flat car to the dock. Later on, a large dray backed up the dock and fourteen men, aided by the high-speed derrick, finally succeeded in lifting each plate on to the dray.

There is another phase of the freight-handling question that deserves careful consideration. In recent years certain shipping companies have operated their own motor trucks. These trucks call for freight and deliver it to the vessels, while at the port of destination, other trucks distribute the freight among consignees. I know of a number

of steamship companies that have practically doubled the amount of freight they handle and increased their radius of operation two-fold by such a system of collecting and delivering.

If the general run of American shippers and importers had a true conception of the present criminal inefficiency of freight-handling at our ports, and to what extent they themselves are to blame for the condition, there would be such radical changes in practice, that very soon ocean supremacy no longer would be merely a question of seamen's wages.

The United States proposes to compete for the world's trade, but its efforts will be hampered unless more consideration is given to efficient methods and devices for handling freight. In the discharging and loading of a ship the minimum labor cost is about 85 cents a ton and is continually increasing. In order to handle 10,000 tons inbound and 10,000 tons outbound, or 20,000 tons in all, the total cost for discharging and loading would amount to \$17,000. Through the use of the latest mechanical appliances, this handling charge can be reduced to only a little more than \$5000. In most foreign ports this latter cost prevails. Therefore, if we continue in our present way, what chance have we to gain a strong position in our play for world trade?

Fortunately, many people in the United States have finally learned that the important thing is not the cost of actually operating a ship, but rather the cost of keeping the vessel idle. The present high wages alone are a sufficient argument in favor of speedy ship loading. In countries where labor costs are low, this reason would not be so valid. Nevertheless, among the

more important nations, that country which can coal and load its ships the fastest, will possess a valuable advantage in the coming race for world trade and marine supremacy.

CHAPTER IX

APPLICATION OF SCIENCE TO INDUSTRY

Progress of Science—Industrial Use of the Airplane—Aerial Photography—Commercial Uses of the X-ray—Motion Analysis in Industry.

Progress of Science. The well-known saying—"The luxury of to-day becomes the necessity of to-morrow"—can aptly be paraphrased to read—"The abstract scientific principle of to-day becomes the concrete industrial practice of to-morrow." The application in industry and commerce of scientific instruments and devices that only a short time ago were thought to possess limited use in the research laboratory, is an indication that our imagination ever keeps pace with our utilitarian needs. At just what point have we arrived in life's great adventure? Will the present century surpass the last one in the matter of marvelous discoveries?

The development of every science is nothing more than the story of the substitution of new for old facts. The common mistake of all time has been the reluctance of the people to accept as truth such new ideas as affect the even course of their thoughts and ways.

If there ever was an age when people were justified in maintaining an open and receptive mind, that time is now. No longer is science shrouded in the black cloak of superstition and mystery. The philosopher and inventor of to-day is a cost reducer, and no one will

deny that we need an army of him well distributed throughout all lands at the present moment.

Whether it has been due to the mental stimulus of war, or to the economic difficulties of the day, the situation with respect to new and promising discoveries is both interesting and hopeful. In England, Sir Ernest Rutherford appears to be well on the way to a solution of the problem of the ages—the transmutation of matter. Another Britisher has accomplished a big thing in perfecting a novel wireless emergency calling device for the use of ships in distress. This new device makes it possible for any station or ship equipped with a special automatic transmitter key to call up any other station or ship that is within range, and that is fitted with a corresponding selective receiver, even if the operator is absent from his post.

Italy, the land without fuel, has made a reality of the electric furnace for the production of iron and steel. In many of the war-ridden countries of Europe, the scarcity of certain materials compelled the chemists of these nations to find new ways of doing things. An example is the discovery of an excellent substitute for the antimony coating that was formerly used on the sides of safety match-boxes. The new compound is lighter, fifty per cent. cheaper, and possesses greater igniting qualities.

German and British inventors have perfected a new type of cinematograph screen that will reproduce pictures in daylight or in a brightly lighted room as clearly and distinctly as those now shown in a darkened theater. On the Canadian Pacific Coast an ambitious and apparently successful attempt is being made to manufacture a valuable fertilizing agent in the form of

fish meal from the offal of the fishes that are caught for food. A splendid oil suitable for manufacture into soap is also recovered from the waste. Seaweed is abundant all over the world, but it remained for a Dane to devise a method for producing a cattle food from this heretofore worthless material.

In the development of electric arc welding methods the United States played no small part. The story of the speedy repairs to the interned German ships, which it had been thought were damaged beyond redemption, is now ancient history. When looked at in relation to speeding up production and saving huge quantities of material which would otherwise go to waste, arc welding is a remarkable development.

Our chemists, too, have literally performed miracles in the discovery of new dyes and the utilization for commercial purposes of what was thought to be nothing but waste material. Dyes and a number of other valuable substances are now being made from corn cobs; from sawdust a cattle feed rich in nutritive elements is made, the result of experiments by the Bureau of Chemistry of the Department of Agriculture.

These are but a few of the accomplishments of science in the realm of industry. The X-ray is now being put to uses that its discoverer never even dreamed of; the airplane is fast establishing itself as an added and important link in our transportation system; the motion picture machine is now invaluable in our schools and colleges as an adjunct to education, and also as a medium for the analysis of motion in the laboratory and in the field.

The present century, so far as the progress of science is concerned, has started well. Who can say what the future holds in store?

Industrial Use of the Airplane. Specific instances just now throughout the United States and Europe show the increasing utility of aircraft in business and industrial life. In the newspaper field, experiments have already been conducted to show the possibilities of air delivery for the great metropolitan papers. The essence of news is speed, and the chief virtue of the airplane is likewise speed. One investigator with the results of actual tests before him, states that the cost of newspaper deliveries in certain places already compares favorably with the cost of delivery by other methods.

Some months ago a plane was requisitioned to carry 600 pounds of silks, linens, lingerie, etc., from New York to Minneapolis. The difficulties attending the railroad congestion of freight made this form of delivery desirable if not absolutely necessary. The 1600-mile flight was made in 23 hours and 40 minutes, while the cargo carried was worth \$10,000. The United States Aerial Mail now reaches across the continent, having recently been extended to the Pacific Coast. An air line for mail is being established between Seattle and Vancouver and will carry 750 pounds of mail daily. As Vancouver is much nearer Asia than is San Francisco, an entire day in transpacific passage will be saved. In a number of localities, physicians are using planes to make emergency calls. One great rubber company is arranging to place a 300-foot, non-rigid dirigible in experimental commercial operation between Akron and Detroit, a distance of 250 miles. The time by air is four hours, while by train or boat eight hours or more are required. One large bank recently found the airplane a real life-saver when a time of stress came upon

the institution and a large amount of money was needed on short notice.

Airplanes are being used in the patrolling of large acreages of rice lands in California. The aviators who do this work are ex-service men, and they get fifty cents an acre. A season's work nets the boys a handsome sum, for in one case three aviators took care of a tract of 32,000 acres. The maintenance which they were obliged to pay amounted to about \$11,000. Several large fishing concerns are now using planes to spot schools of fish and then direct the vessels of the fishing fleet to the proper locations. Up in British Columbia is an important mine located at the top of a rugged mountain, near which is a lake. Although only five miles from tide-water, the trail is so rough that the rich ore has to be packed out and requires a week in transit. The company is preparing to use flying boats, with the lake as a mine terminal.

Aerial Photography. One of the chief uses of the airplane in the immediate future will be in the field of aerial photography. In years past, man has been able to look around and above himself. He has always accepted as one of the problems of life his inability to look down on the earth he lives in. Now that humans can easily and quickly rise into the air and make still or moving pictures of the things below, there is the certainty that many problems will be solved which could not be satisfactorily handled before.

Just as the X-ray machine discloses many of the hidden secrets of the human body, so the aerial camera is rapidly being developed into a wonderful device which will enable us to see and solve some of the puzzles of the earth's surface. Up to the present time our study

of the earth's surface has progressed with tortoise-like slowness. Much of the world has heretofore been inaccessible to observation. Land surveys started in midsummer were frequently carried on and only completed in the winter when surface conditions were considerably changed in appearance. In other cases surveys in certain regions were started in a wet season of the year and could not be completed before a succeeding dry season had become well advanced and important water resources had either diminished or disappeared. Aerial photography will largely eliminate the uncertain results derived by these earlier and more tedious methods. In other words, physical geography and geology will likely be revolutionized through the development of the art of making photographic surveys from airplanes.

Each week now brings some new use for the airplane camera. The chambers of commerce in various cities have lately discovered that aerial photographs are not only the best kind of advertising material, but such maps are of great value in solving the traffic problems of a busy community. Details of the movements of vehicles are readily recorded, and points of congestion located. Officials in summer-resort communities are also employing aerial photographs to show the attractiveness of their beaches, lakes, and surrounding country. In one mosquito-infested region, the problem of eliminating the pest was greatly simplified by an aerial map which showed ponds and pools that were off the main lines of travel, and which would very likely have been overlooked by the mosquito exterminators.

One of the growing uses of aerial photography is the mapping of great private and federal forest tracts,

which could never have been completed by using earlier surveying methods without a large expenditure of time and money. New developments in aerial photography render it possible, through the use of color sensitive plates, to show the different types of trees as well as their location. There is little doubt that in future years all important surveys such as those for railroads and canals will be preceded by a preliminary survey made from an airplane.

The biggest immediate field for the aerial photographer appears to be in the real estate business. The realty broker or salesman of to-morrow will reach over on his desk and produce for his prospect's inspection a series of aerial views that will tell more at a glance about certain houses and residential districts than could be told in pages of descriptive matter. The real estate agent will be able to show his possible customer not only the surrounding streets, houses, and lawns, but the relative locations of trolley lines, churches, schools, and parks. These maps will also show how far it is to the nearest automobile service station, as well as the stores of the butcher, the baker, and the grocer. If everything seems O.K., and the prospect is pleased with a certain property and its surroundings, the realty broker will immediately take his customer to the favored section. With this plan in force, the real estate dealers, as well as home-seekers, will save hours of time through not having to visit residential districts that will fail finally to attract the purchaser.

If it is a factory or manufacturing site the customer is looking for, the aerial photographs will quickly furnish the necessary information and save energy and time that would otherwise be devoted to hours of travel.

In no way can shipping facilities be shown to better advantage than by photographs taken in the air. When it comes to selling farms and similar outlying properties, aerial photographs will soon prove an indispensable adjunct to the present equipment of the modern real estate offices.

The newer types of aerial cameras are automatic machines which can be adjusted for certain altitudes, and so set that exposures are made with clock-like precision at correct intervals so as to produce sufficient overlap to enable the operator to join the finished pictures into one continuous map, or mosaic. The usual overlap is one third of the total length of the picture. The latest preference of air photographers is for films rather than plates, for the film is lighter and can be carried in greater quantities. The camera is so mounted in the plane that it remains in line with the objects to be photographed. In some cases a compass is superimposed so that the direction will be shown on the film.

The pilot of an airplane engaged in photographic work must keep his machine flying on an even keel, and all turns must be made as flat as the machine will allow. The mosaic maps now made show a great deal more detail and are nearly as accurate as precision maps, except in recording elevations. A good aerial mosaic is accurate to within one per cent. As the art develops, the small errors now caused by differences in elevation will be largely overcome. The newer machines are already sufficiently powerful to see beneath the surface of shallow water, and show the depth and location of channels. Practically all of the airplanes now being built for aerial photography are so designed that mod-

ern cameras can be easily and quickly installed. The accepted practice is to provide a mounting for the camera on the interior of the plane, and also to install a small dynamo, which can be attached to the main power plant of the plane and generate current for the automatic operation of the camera.

The uses of aerial photography are too numerous even to be imagined. It is a new industry with a future that has limits as yet unknown. While commercial mapping will be one of the important fields of the new art, advertising specialists, construction engineers, and others will use aerial oblique pictures extensively in the practice of their professions, to show finished developments and construction progress. The infant industry marks a distinct advance in scientific achievement, and there is little doubt that future results will add impetus to the advance of civilization.

Commercial Uses of the X-Ray. Though the mention of X-ray to the average citizen suggests one of the mysteries of science, it is daily becoming more and more apparent that this marvelous discovery of the present generation is to play an important part in our everyday life. Already X-ray photography has developed into a separate and independent industry of far greater extent and importance than is generally imagined. The most rapid advances of the new science have of course taken place in the practice of medicine, where it was first applied.

The greatest growth of X-ray science in America has been in the application of this art in dental practice. The number of dental films used during the last five years has shown an increase of approximately one thousand per cent. However, the most interesting and

promising of the new fields for radiology lies in physical research. Jewelers and dealers in precious stones have found the X-ray a valuable utility in detecting the character of such things as pearls. In many cases people have secured pearls by placing a particle of iron or other material in the shell of an oyster and allowing the oyster to cover the substance with pearl. In one case some Japanese planted small Buddhas in oysters and succeeded in getting some very beautiful pearl ornaments. During the war the X-ray was found quite handy in detecting copper and rubber hidden in bales of cotton that were being exported to Germany.

The application of X-rays in the study of atomic structure is a work of primary scientific importance.

By the phenomena which take place when X-rays strike crystals it is possible to study their innermost structure. It is also possible by direct photographic evidence to study the difference in the arrangement of atoms in different chemicals. One large company, using five million pieces of mica annually in the manufacture of delicate machines, uses an X-ray outfit in order to discover and eliminate any piece of mica that is faulty. The detection of flaws in mica that is to be used for insulation purposes is a matter of high importance.

The latest method of using the X-ray in chemical analysis consists in reducing to powder form the substance to be examined, placing it in a small glass tube, sending a beam of rays through it, and then photographing the diffraction pattern produced. A. W. Hull, an authority in this work, states that the only apparatus required is a source of voltage, an X-ray tube, and a photographic plate or film. The amount of material

necessary for a determination is one cubic millimeter. The method is applicable to all chemical elements and compounds which are crystalline in structure. Substances with different crystalline structures will give entirely different patterns of lines.

An exposure of one hour will generally give all the information desired, and there is no damage done to the specimen.

Application of the X-ray in the radio-examination of materials to determine their structure and to detect flaws is attracting attention. It is possible by this method to obtain a photograph of flaws in metal castings which could not be detected otherwise except by making a section of the specimen. Investigations have shown that radiographs of cord or fabric automobile tires will disclose the internal structure and expose flaws. Recent developments in photographic materials make it possible to use X-rays of suitable wave length for photographing very small specimens, which are afterward enlarged. It is practicable by this method to analyze geological, metallurgical, and biological specimens, which cannot be satisfactorily photographed by ordinary photomicrography.

It should no longer be assumed, therefore, that the science of X-ray is destined to be an art of limited domain. On the contrary, this comparatively new discovery is fast developing an industry of sizable proportions. Four or five per cent. of the shoes that are manufactured in some of our largest factories have nails projecting into them that may cause unpleasant moments, if not subsequent evil consequences to the unlucky individual who may happen to put his foot into one of these defective shoes. A plan has been worked

out whereby a large output of footwear, placed on its side, will be carried along by a conveyor over a screen with X-rays underneath. Workmen note and mark the shoes containing the projecting nails. These shoes are then placed upright on the conveyor and are easily picked off at a point farther along. Further studies are likely to show that the effect of X-rays on certain forms of objectionable animal life may be turned to good advantage. Interesting results have already been secured in combating the destructive little beetle that is so harmful to cigarettes and cigars.

Not many people realize that thousands of bales of cotton are required annually in the manufacture of the thin transparent backing on which the light sensitive coating is spread in making films for radiology. Few people know that three tons of silver bullion are used each week in one plant for making this specially prepared coating. The yearly consumption of silver by this single company amounts to nearly three quarters as much as the annual production of silver in Arizona, one of our principal silver-producing States.

All of which furnishes good ground for the belief that the vast strides made in X-ray photography in recent years are but a small indication of the immense possibilities that lie within the reach of this new and little-known science.

Motion Analysis in Industry. The motion picture has furnished entertainment for millions of people for many years, but it is only during more recent years that this great invention has commenced to perform a real service in our educational and industrial life. Just as it has happened in the case of a large number of other inventions, the first stage in the development of

the motion-picture camera has been devoted to furnishing amusement. So it was with the automobile; once it was purely a luxury, while to-day it is a necessity of the first order. There are imaginative people who already believe that motion pictures and the apparatus that makes them will one day be a business and scientific utility covering a field of no less extent and importance than is now covered in the amusement world.

Perhaps the most promising opportunity along commercial lines lies in the use of the high-speed camera to analyze movements of all kinds. It so happens that the normal human eye can record only something like sixteen different impressions of any given action during one second of time. It is for this reason that the standard motion-picture camera is adjusted to expose film to the subject sixteen times per second. In other words, the ordinary camera used in making a motion picture takes sixteen pictures per second and in normal action projects these pictures on the screen at the same rate. In the pictures where motion is analyzed a camera is used that will take 160 to 300 pictures per second. Later this positive print is projected on the screen at the normal speed of sixteen photographs per second. When this is done the movements of the subject are slowed down so materially that every motion can be easily distinguished.

Because of the tremendous speed at which the cameras work and the rapidity of exposures of film per second this type of fast photography requires approximately five times the illumination that ordinarily is sufficient for any standard motion-picture camera. The art has been developed in France to even a higher degree than it has here in the United States. Though it seems

incredible, a noted French inventor has perfected a high-speed camera capable of making fifteen thousand exposures per second. This scientist with his remarkable device has successfully photographed projectiles in flight. It is believed that the results of the work will prove of value to ordnance experts. It is also likely that other extremely rapid processes in the life of man and in Nature, which have heretofore escaped our observation, will now be caught and analyzed through rapid photography.

For most of our present purposes, however, a camera speed of 160 to 180 exposures per second, which is ten times as fast as the eye can record, is best adapted for our most common business and scientific needs. Films made at such a speed and normally projected afford an opportunity for a perfect eye analysis of every component move of the subject filmed. When extremely high speeds are used the advantages are but slightly increased and the work becomes quite costly, due to the wastage of negative raw stock. Though camera construction is the fundamental basis of successful high-speed motion-picture photography, treatment of negative raw stock is an essential attribute to perfect results. The handling and treatment of negative unexposed raw stock are most delicate operations, calling for careful and timed manipulation.

It is probable that millions of people have been interested and amused by the moving pictures showing athletes, dancers, and other performers, first in normal action and afterward going through the same motions so slowly on the screen that every movement might be carefully noted and analyzed. In making these pictures two cameras are set up side by side, one taking

only sixteen exposures per second and the other 160 or more. It is evident therefore that if an athlete consumes one second in making a dive or in turning a somersault the standard camera gets sixteen pictures of the total movement, while the high-speed instrument gets nine additional photographs between each two of those taken by the standard camera. When these negatives, made at such high speed, are run slowly, the motions are extraordinarily delayed and the subjects appear actually to float in the air.

The new and promising field for this art, however, is not in the theaters of the country, but in the application of analysis of motion pictures to business problems. Only a short time ago a racing airship was placed in such a position that the propeller received the full benefit of the sunlight, and then, while making sixteen hundred revolutions per minute, its operation was filmed by both the standard camera and an ultra-rapid instrument. When the results were shown on the screen the pictures of the standard camera were exactly what the eye would have noted—that is, merely a blur, offering little obstacle to a clear vision of the scenery in the background. The pictures of the high-speed camera disclosed the metal tippings on the ends of the propeller blades, and it was possible to count the bolt heads, nine in number, used to fasten the propeller to the main shaft.

A series of most interesting experiments has been made for the purpose of clearing up certain doubtful opinions concerning the action of the human heart under various conditions. In getting at the facts several twenty-pound bulldogs were the subjects used. The films that were made detected actions of the hearts

of the animals that could not have been noted by the human eye, and the results are expected to be of great value to the medical profession in enlarging the present understanding of the circulation of the blood and minute actions of the heart and lungs.

The high-speed camera was also utilized recently in making an analysis of the spring and body action of motor trucks subjected to shocks on rough roads. Seven trucks were furnished, varying from one and a half to seven tons in capacity. A runway was built, ten feet long, and having a take-off, two and a half feet high, at one end. Just back of the point where the trucks shot into the air was a ten-foot screen marked off in one-foot squares. There was also a baseboard marked in one-foot spaces. These measuring devices enabled the operators to get the height and length of the jump. In addition there was a measuring device extending from the mudguard of the body of the truck to the center of the hub of the wheel, which was designed to record the spring action. The trucks were started about 300 yards back of the runway, and reached a speed of 15 to 20 miles an hour by the time they ascended the runway and jumped through the air. The average jump was about six feet in height and sixteen feet in length.

High-speed cameras were set up, and a film was made of the action of each truck. When these pictures were later shown on the screen at normal speed they made it possible for those interested to analyze rigidity and flexibility of the truck bodies, shifting of the loads, reactions of the springs and impact of the tires. Several interesting discoveries were made, one seeming to indicate that the spring of a truck will often break in the

air before it has been subjected to the impact of the car when it again hits the ground. All such actions are entirely too speedy to be discerned by the eye.

Other interesting tests furnished much information concerning the deflection and expansion of pneumatic tires used on trucks and automobiles. In these latter experiments the cars were run over railroad tracks, up and over curbstones and other damaging obstacles. Other studies covered the cause and action of cars in skidding, when relieved of the maximum load through the body lift consequent to the rebound in going over rough places.

One of the latest achievements of the high-speed camera was in the case of a young woman who was terribly frightened three years ago during the course of a thunderstorm accompanied by vivid flashes of lighting. Up to the time of this occurrence she had been in splendid health, but following the storm she developed a form of hysteria which left her in a pitiable condition. She is constantly in action, thrashing round with her arms, body, and legs. In filming this subject the high-speed camera showed the doctors a peculiar and hitherto unsuspected and unknown muscle wave extending from the hip to below the knee. Eminent physicians, members of the American Neurological Association, state that this condition probably exists in all cases of hysteria, and that heretofore it has been unknown because of the inability of the human eye to discern the motion.

A street-car company operating in a Middle Western city is arranging a series of experiments to determine why the wheel of the trolley pole hops so often. The proposed plan is to build a short line of track alongside

the main line of trolley and then place the high-speed camera on a specially built car which will run along beside the regular trolley car and at an equal speed with it.

It is expected that the resulting motion picture will enable the trolley operators to analyze the action of the wheel at the end of the pole, and provide a remedy for this nuisance, which has caused great losses through innumerable delays.

In the practice of electric welding certain unfavorable conditions have been complained of, and the ultra-rapid camera is to be called in to record the action that takes place and to permit the welders to analyze the process and determine whether the trouble is due to molten metal, the cutting tool, or some other agency. Tire manufacturers are also expecting to be benefited by films showing the mixing of crude rubber and later the rubber going through the rolls. They also believe that such photographs of tests to determine the strength of tire fabrics will provide knowledge that the eye has failed to disclose. Steel engineers who are familiar with the recent accomplishments of high-speed photography assert that a photographic analysis of this kind will probably show conclusively the part that crystals play in the breaking of a bar of steel.

Several months ago a well-known exponent of legerdemain performed some sleight-of-hand tricks before the camera. When the film was later shown on the screen the mystery of several familiar card tricks was promptly dispelled, for what the eye could not detect the camera had easily caught. A short time after this one of the country's most famous magicians had been about persuaded to pose before the camera

while performing some of his marvelous feats. Unfortunately the celebrated entertainer accepted an invitation to witness the pictures above mentioned, and immediately changed his mind, refusing to appear for any payment within reason that might be offered.

All the foregoing is intended merely to convey an idea of the great possibilities that lie in this photographic field of analyzing movements that are too speedy for the human eye. A big manufacturing company was having a lot of trouble with one of its high-speed machines. When the machine was operating in normal fashion its motion was too rapid for any of the observers to determine what the fault was. When the machine was slowed down, so its movements could be noted, the fault complained of did not occur. A film showing the operation of the machine is now being made, and there is every expectation that the trouble will be located and probably remedied.

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